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Another Catalytic Oil Process

THE catalytic production of oil by purely chemical methods has proved to be of considerable fascination to inventors. This is not surprising because there is no need to install the expensive apparatus required for hydrogenation, and the chemical possibilities are both considerable and interesting. The Fischer-Tropsch process has stolen the limelight partly because it was the first in the field since the whole idea of synthetic production of oil from water gas is based on the discoveries made by these two investigators, and partly because it has been erected on the industrial scale in many countries. It seemed at one time as if it was preferred in Germany even to hydrogenation, but later news suggests that the German production of hydrogenation oils will be in the neighbourhood of 1,000,000 tons this year, and that projected plants may bring the amount up to double this figure. It has been known for some time that there was a British process in the field on similar lines to the Fischer-Tropsch process, namely, the Robinson-Bindley process. A paper by Dr. W. W. Myddleton describing the later developments of this process was referred to in THE CHEMICAL AGE last week, and many who went to the meeting at which this paper was read were curious to ascertain on what grounds it was found possible to avoid the existing Fischer patents; large chemical concerns, and particularly some of the foreign ones, have always been adept at closing all loopholes by which a rival, similar, patent could be secured.

The object in this process, however, is not to produce low-boiling combustible oils without reference to their composition, but to produce an oil containing the maximum content of olefines, largely on the ground that a high-olefine content raises the octane number of the oil. For this object to be achieved it is necessary to reduce the activity of the catalyst to prevent too-complete hydrogenation. A cobalt catalyst was found to achieve the desired result. Secondly, the Fischer process demands a gas that conforms in composition closely to the volume ratio: $CO:2H_2$. Dr. Myddleton asserts that this is unnecessary and that blue water gas, with the ratio $CO:H_2$, or $CO:1.2H_2$, is equally suitable and gives an oil of increased content. The Fischer process necessitates the removal of all sulphur compounds down to about 0.1 grain per 100 cu. ft. Dr. Myddleton claims that his process will operate on gas containing 25 grains per cu. ft. Furthermore, not only are his catalysts not susceptible to poisoning, but the activity of the catalyst can be controlled by the sulphur content of the gas. These three features, the production of a high-octane spirit, the avoidance of preparing the expensive $CO:2H_2$ mixture, and the use of unpurified gas, would improve the value of the product and reduce the cost of operation considerably.

The proof of the pudding will be in the eating. If the process under these conditions can operate successfully on the commercial scale, Dr. Myddleton's contentions can be taken as proved, assuming, of course, that they are put into practice on the commercial plant. Unfortunately, doubt must be expressed as to whether the installation now in course of erection can be described as a commercial unit. It is to produce from 136 to 180 gallons per day of synthetic product, or, let us say, 200 tons per year. The economic unit in the Fischer-Tropsch process is 20,000 tons per year, and it does not seem to be likely that the advantages claimed for the British process will enable economic operation to be possible on 1/100th of the scale required for the Fischer-Tropsch process. Those who have studied Professor Fischer's papers know that he has worked with gases of the composition $CO:H_2$ and abandoned the practice as not being economic; it seems clear that since the olefine content of Dr. Myddleton's oils is similar to that of Fischer and Tropsch, the sum of the various reactions taking place is expressed broadly in both instances by the equation $CO + 2H_2 = (CH_2) + H_2O$, and any departure from this composition must cause waste of fuel in the form of CO; it seems a question of balancing this loss and other factors introduced by working with a synthesis gas having a ratio $CO:H_2$ between 1 and 1.5, against the cost of producing the 1:2 synthesis gas.

The sulphur observation needs some explanation also. Where has the sulphur gone? What is the sulphur balance-sheet? Can it be that sulphur is slowly being adsorbed in the catalyst and will cause sudden failure? British chemists will wish well to this attempt to produce an improved synthetic oil process in this country, but having in mind the fate that so often befalls a process when translated upon the commercial scale, they will no doubt at present retain an open mind.

"The railways were among the pioneers of the application of chemistry in general industry."

—*Dr. Lewis-Dale.*

Notes and Comments

Plant Associations

THERE was an interesting discussion recently as to how far such industries as those operating gasworks and coke ovens could be described as "chemical." It appears impossible to decide where the borderline lies, but to chemists coal processing in all its forms is a chemical industry; it employs chemists and it depends on chemistry and on chemical engineering. It happens, naturally, that quite a large number of the firms comprising the British Chemical Plant Manufacturers' Association are members also of the similar organisation—the Society of British Gas Industries. The S.B.G.I. is larger than the B.C.P.M.A. and differs from it in being divided into many sections. Probably there would be no point in so subdividing the B.C.P.M.A. It differs also in that the S.B.G.I. elects each year a prominent industrialist as president, and in consequence hears some exceedingly interesting presidential addresses. The address was delivered this year by Sir Harold Hartley, vice-president of the L.M.S. Railway, chairman of the Fuel Research Board, and director of the Gas Light and Coke Company, a chemist of no mean repute. Some of his words might have been taken from an address to the chemical industries. He showed that the expansion of trade in the Victorian period was due to the expansion of the known boundaries of the world by explorers and to their exploitation by settlers. This movement ceased in the natural order of things and meanwhile, "another, destined in a sense to take its place, was gathering momentum. The boundaries of science were being steadily extended and the power of man over matter was becoming even more potent than the accessibility of raw materials."

The March of Science

SIR HAROLD HARTLEY roundly declared that the strength and vitality of an industry to-day largely depended on its willingness and ability to apply the resources of science to its problems. Research is the best insurance of the future, and this scientific outlook is one of the characteristics of modern business. The second new characteristic is new purchasing power, and Sir Harold does not subscribe wholly to the view that it has come about through the re-distribution of incomes; he believes that it is more truly the result of the increased production made possible by scientific development, and by the better utilisation of the world supplies of raw materials, food and labour, which have brought new industries into existence, a channel into which a large volume of production is to-day concentrated. Sir Harold notes that a third result of increased scientific outlook is the tendency to group industry into large production units to get the maximum advantages of specialisation in every direction—research, design, production and marketing—and to avaid uneconomic competition.

Individualism or Specialisation

IT seems clear that the day of individualism is passing and that organisation and planning are becoming more essential. The difficulty with the next generation, in the light of all this specialisation, may well be to find men capable of directing these great enterprises. A chemist, long since dead, but who would have become very eminent had he lived to the full span, always insisted to his staff: "Be wide." The avoidance of too-narrow specialisation was his standard advice to all young men, but that was nearly 30 years ago. Are we moderns right, or not, to place this reliance upon specialisation? As firms, thinking of the services that employees can render, we should probably be correct in approving of specialisation, provided that Sir Harold's third point of large production units were also granted. Over-specialisation, however, does not readily lead to the training of men capable of that wide outlook necessary in a good manager. From the point of view of the individual, however, the problem is a little different. If only one's mentality is such that one can work better as a member of a team, by all means specialise and occupy a steady position in the team. If one is an individualist, do not specialise, for the specialist in industry can only work in a team, and having been dropped from the team for any reason, he will find it harder to secure another post.

Indian Protest Against Concessions

THE Indian Merchants' Chamber, at Bombay, has sent a protest to the Government of India taking objection to the manner in which foreign concerns are allowed to start their own protected companies freely in India. Making specific mention of the flotation of the Alkali and Chemical Corporation of India, Ltd., started as a subsidiary to Imperial Chemical Industries, Ltd., the Chamber states that from the terms of the issue of the shares it is obvious that the new company will continue as one of the side interests of Imperial Chemical Industries (India), Ltd. The attempt to give this new department of Imperial Chemical Industries a separate legal entity, according to the Chamber, will not impress the people of India, nor will the earlier objections to the grant of concesssions to Imperial Chemical Industries (India), Ltd., for exploiting the mineral resources in certain parts of the Punjab, be diminished. Here, it is stated, there is a clear case of discrimination in favour of non-nationals to the detriment of the national interests of India.

Nationals and Non-Nationals

THE need for some distinction as between nationals and non-nationals in the matter of certain economic activities was, in the past, recognised and observed in India. So far as direct assistance by the State to any trade or industry, either in the nature of bounties or subsidies or by protection, was concerned, it was generally the accepted policy that the benefits of such assistance should be extended only to companies which conformed to certain standards giving the right to be treated as national organisations. With regard to the concessions that have been granted to Imperial Chemical Industries (India), Ltd., and, through them, now to the Alkali and Chemical Corporation of India, Ltd., the point arises, in the light of the remarks of the External Capital Committee, as to what efforts, if any, were made to ascertain whether Indian capital would be forthcoming for the purpose on reasonable terms and what safeguards were imposed while giving concessions. In order that there may not be occasions for similar grievances in the future, it is felt in India it should be laid down that information about commercial possibilities in respect of such concessions should be made available to the nationals of the country, in order that sufficient opportunities are afforded for taking advantage of any such concessions. Whatever the constitutional position, the Indian Merchants' Chamber emphasises that it must draw the attention of the Government to the handicaps which such provisions have placed on the development of Indian industries and Indian enterprise.

Notes on Some Organic Compounds of Sulphur

By
J. WAKELIN

SULPHUR and its compounds occurs so universally in the materials and commodities of science and commerce that it might well be urged that to find a theme entirely unconnected with this element would be a more difficult proposition than the choice of a study dealing with nothing else. Sulphur itself, the element, is known to everyone; sulphates of the common metals are amongst the most familiar of all the materials of chemical commerce, whilst sulphuric acid is to be met with in practically all branches of industry. Adequately to describe all the uses and appliances of sulphur's numerous derivatives would require a very lengthy book or library of books. It is, of course, clear that no such comprehensive undertaking could be attempted here, it being the purpose to discuss briefly a few of the lesser known compounds of sulphur such as sulphonium compounds, mercaptans, sulphones, etc., and to indicate their commercial possibilities and probable uses.

The compounds known as mercaptans, possessing the distinctive group—SH, have, as a rule, an unpleasant smell and about the only direct application of note is as a warning odour for gas lines. Thus, about one pound of amyl mercaptan per million cubic feet of gas is detectable when such a gas is admixed with over 99 parts of air. Detection of leaks is therefore facilitated.

Some of the most interesting sulphur compounds of recent discovery contain a high molecular weight fatty residue which in most cases tends to give them surface active properties. It is convenient to regard the fatty radicle as conferring wetting and spreading power whilst the sulphur gives disinfectant or bactericidal qualities, in the case of those compounds adapted to such purposes.

Preparation of Fatty Mercaptans

The relationship of the fatty alcohols to the fatty acids will already be familiar. Just as acetic acid is reducible to ethyl alcohol (at any rate, in theory), all fatty acids are similarly convertible to an alcohol with an equal number of carbon atoms. Palmitic acid, $C_{15}H_{13}.COOH$ gives the corresponding cetyl alcohol, $C_{16}H_{33}OH$, and so on. The mercaptan of cetyl alcohol is thus $C_{16}H_{33}.SH$. The alcohols themselves are almost insoluble in water, but conversion to the sulphuric acid ester transforms them to the well-known sulphated fatty alcohols which are readily soluble in water and possess considerable detergent powers. These bodies are now available commercially to-day in this country.

A patent to Henkel et Cie shows that fatty mercaptans may be obtained from sulphated fatty alcohols by treatment with hydrogen sulphide and caustic soda. Sodium dodecyl sulphate yields dodecyl mercaptan. More recently the I. G. Farbenindustrie manufacture the same type of compounds by passing the vapour of the aliphatic alcohol over a dehydrating catalyst together with hydrogen sulphide (Brit. Pat. 454,668.). Octadecyl alcohol is reacted by means of a catalyst consisting of granular zirconium oxide, or the same oxide and pumice meal, to give with hydrogen sulphide octadecyl mercaptan. Titanium oxide is another catalyst proposed for the same transformation.

Compounds Derived from Mercaptans

There are any number of interesting reactions possible with the alkyl and fatty mercaptans, the products from which in many cases are wetting agents or bactericides, but have uses in many spheres of industry and technology.

According to Henkel et Cie, who incidentally have many patents in this field, the reaction of a fatty mercaptan with ethyl chlor-acetate in the presence of sodium methanolate gives the ethyl ester of dodecyl-S-thioglycollate which on saponification yields the sodium salt. Such a product possesses saponaceous and emulsifying properties and has uses in the rubber and pharmaceutical industries.

$$C_{12}H_{25}.S.H + Cl.CH_2.COOEt \rightarrow C_{12}H_{25}.S.CH_2.COOEt$$

Quite a different sort of compound is obtainable by the I. G. Farbenindustrie by condensing dodecyl mercaptan, formaldehyde and hydrogen chloride. The product, dodecyl thiomethyl chloride, $C_{12}H_{25}.S.CH_2.Cl$ is united with a tertiary amine such as trimethylamine to give a species of quaternary ammonium compound, trimethyl-dodecyl-thiomethyl-ammonium chloride. In this instance the sulphur becomes linked to nitrogen via one $—CH_2—$group. Another derivative of the same order is made by reacting sodium dodecyl mercaptan with diethylaminoethyl chloride. The resulting tertiary amine is then methylated with iodide to give the quaternary methyl-diethyl-dodecylthioethyl-ammonium iodide wherein the sulphur atom is separated from the nitrogen by $—CH_2.CH_2—$. The full formula may be written as follows:—

$$C_{12}H_{25}.S.CH_2.CH_2.N(C_2H_5)_2(CH_3)I$$

I

These compounds are stated to possess bactericidal and fungicidal qualities and may be incorporated with inert dispersing agents. The interesting point about these compounds which were patented a few years ago is that they are very nearly the sulphur analogues of the quaternary ether compounds now employed for obtaining the permanent waterproof finish on textiles (*e.g.*, "Velan"). In place of the oxygen bridge, here there is a sulphur atom. Suppose that such compounds were applied to wool, dried and baked on. There is reason to suppose that a similar finish might be obtained which was not only waterproof but, perhaps, mothproof.

Vinyl Thioethers

Another interesting chapter in the chemistry of the organic sulphur compounds springs from the reaction between aliphatic and aromatic mercaptans and acetylene. According to the I. G. Farbenindustrie, methyl, hexyl, dodecyl, thiophenol, thiocresol and 2-mercaptobenzthiazole condenses with acetylene in the presence of a basic metal catalyst, to form a thiovinyl ether of the general formula: $R—S—CH=CH_2$. For instance, a mixture of acetylene and nitrogen is passed at 160° C. and 15 atmospheres into a stirring autoclave which contains thiophenol, butanol and caustic soda. After some 12 hours, thiophenyl vinyl ether is produced. Alternatively, para thiocresol gives *p*-thiocresol vinyl ether and so on. When a catalyst of zinc or cadmium is employed, condensation may go further than to form a vinyl ether, an ethane diothole of the general formula $R—S—CH_2—CH_2—S—R$ may be formed also. All such bodies are stated to be useful as intermediates in the manufacture of dyes, as textile auxiliary compounds, or as vulcanisation accelerators.

By subjecting these vinyl thioethers to mild oxidising reagents, vinyl sulphoxides and sulphones are obtained. It will be recalled that in general mercaptans undergo oxidation with peroxide to give a sulphoxide whose general formula may be written $R—SO—R'$. These are usually thick oils and reduction converts them back to the mercaptan. Stronger oxidation of a mercaptan, however, as with permanganate causes the formation of the sulphone $R—SO_2—R'$. These are more stable than the sulphoxides and cannot be reduced again to the original mercaptan.

All sorts of vinyl thiethers may be treated, but the end product obtained depends upon the temperature and choice

of catalyst. Hydrogen peroxide, for example, yields sulphoxides at —10° to 50° C., yet when used in excess at 50° to 120° C. gives sulphones. Sodium hypochlorite, however, in excess at 30° to 100° C. produces the sulphoxide. The sulphone from vinyl para-thiocresyl ether by treatment with hydrogen peroxide at 100° C. is vinyl paratolyl sulphone. Vinyl ethyl sulphide yields vinyl ethyl sulphone by the action of peroxide at 70° to 80°. The products generally are stated to be suitable intermediates for the preparation of dyestuffs. They may also be made to undergo a number of chemical changes resulting in the formation of technically useful chemical auxiliaries.

Pesticides and Textile Assistants

Vinyl sulphones with ammonia or primary and secondary amines yield substances suitable for combating animal and vegetable pests, as assistants for textile processing or as intermediates for dyes or even as dyes themselves. Vinyl para-tolyl sulphone is refluxed with aqueous ammonia to give bis-(beta-(paratolyl)-sulphonethyl)-amine, whence it would seem that addition occurs at the unsaturated vinyl residue. In place of ammonia mono or diethanolamine may be used, but naturally, tertiary amines without a free hydrogen atom are ruled out. (Brit. Pat. 442,525.)

Probably the most important reaction of the vinyl sulphones is that with sodium bisulphite when a sulphonic acid-like derivative is obtained. Dodecyl vinyl sulphone heated with a solution of sodium bisulphite gives a product whose formula is probably:

$$C_{12}H_{25}.SO_2.CH_2.CH_2.SO_3Na$$

The vinyl sulphones of other fatty alcohols give similar products, whose usefulness is indicated as assistants for the textile industries. There is an unmistakable similarity between the above formula and that commonly given for one of the Igepon wetting agents:

$$C_{17}H_{33}.CO.O.CH_2.CH_2.SO_3Na,$$

but perhaps that may be coincidence.

Dyestuffs and intermediates for the same are obtained from aromatic vinyl sulphones and bisulphite, vinyl tolyl sulphone giving a body whose formula is $CH_3.C_6H_4.SO_2.CH_2.CH_2.SO_3Na$. There are several patents relating to vinyl sulphones in the literature which justify special study.

Sulphonium Compounds

The valence of sulphur is not fully satisfied in the mercaptans, but it may add on still further units to give a sulphonium grouping akin to the quaternary form of tertiary amines. Methyl ethyl thioether will unite with an alkyl halide to form such a sulphonium, as, for example, cetyl iodide to give methylethyl cetyl sulphonium iodide:

Such a compound, introducing a fatty alcohol radicle may be expected to have surface active qualities in addition to any properties endowed by the sulphonium grouping. The above halide may be treated to convert it to the hydroxide with the removal of iodine.

The uses of the sulphonium compounds are numerous and cover a fairly wide field. Antiseptic powers are ascribed to certain compounds of this family by Chemische Fabrik von Heyden, of Dresden (Brit. Pat. 464,330). The germicidal abilities of these are said to be effective in the presence of various nutrient media. An aqueous solution of the fission product of casein (10 per cent.) remained clear and undecomposed after standing several months in contact with 0.1 per cent. of mixture of sulphonium compounds. These included octyl-dodecyl-methyl-sulphonium methosulphate and tetradecyl dimethyl sulphonium methosulphate. Again, a nutrient gelatine containing dextrose was kept sound for above 90 days with 0.05 per cent. of a mixture of sulphonium compounds. The germicidal properties of the compounds may be put to good account in the preparation of ointments and disinfecting solutions for surgical use

Alkyl substituted sulphonium compounds endow cotton and similar textile materials with an increased affinity for mordant and direct dyestuffs. Trimethyl sulphonium salts possess this power, but more recently there have been attempts to employ sulphoniums containing a fatty residue. In Brit. Pat. 438,508, a mixed fabric of viscose and cotton is treated with a solution of methyl-ethyl-cetyl-sulphonium hydroxide for one hour at 90° C. After centrifuging it is then dyed with Triazole Dark Blue BH in a bath containing Glaubers salt at 90° C. According to the I. G. Farbenindustrie, compounds containing two sulphonium groups are useful agents in the dyeing of textile fibres, and kindred processes. They have wetting, foaming and emulsifying powers, and cellulosic material after-treated with them after dyeing are rendered faster to water perspiration and washing (Brit. Pat. 466,734).

The wetting and surface active qualities of the sulphonium compounds makes them helpful in the removal of dye from dyed material, that is in stripping. They may be employed in conjunction with alkali and/or hydrosulphite at 50° to 100° C. They have also been proposed as reserving agents for obtaining fancy printing effects with the sulphuric esters of the leuco vat dyes. The presence of such a compound prevents the dye fixing itself in the pasted regions and so these finally remain white whilst the rest is coloured.

Distilled Water

Refractive Index and Dispersion

IN order to permit accurate use of distilled water as a standard sample in precision refractometry, L. W. Tilton and J. K. Taylor, of the National Bureau of Standards, in the United States, have made determinations of the refractive index and dispersion of distilled water for visible radiation, at temperatures from 0 to 60° C.

A spectrometer, water-jacketed hollow prisms of nickel and platinum-resistance thermometers were used in the minimum-deviation measurements. Samples from a continuously operating still were taken on 93 days during a period of three years and observations at 133 temperature-wavelength co-ordinates were repeated on each of three days by each of the authors. All known requisites for precision and accuracy within approximately $\pm 1 \times 10^{-6}$ in index were employed, and the results, which are given in the April number of the National Bureau Standards' "Journal of Research" (RP1085), are corrected so as to refer to dry air at a pressure of 760 mm. and at the temperature of the water.

The data were adjusted by least squares and are represented by a general formula having 13 constants, the average of the 133 residuals being 1.2×10^{-6}. A general double-entry table of refractive indices (6,776 listed values) with temperature and wavelength as arguments has been computed to yield sixth-decimal-place data by linear interpolation. More specific tables give indices for the D lines of sodium and for 12 other commonly used spectral lines. The maximum refractivity of water is found to be near 0° C., but the exact temperature is a function of the wavelength, with a total variation of approximately 0.5° C. for the visible spectral range. Tables and graphs for specific refraction and for partial dispersions are given and evidences of slight systematic errors are discussed.

The precision of these data is higher than has hitherto been attained, but there is marked disagreement (approx. $\pm 1 \times 10^{-5}$) with some of Flatow's indices which have been widely used and are the basis for the data on water as given in the International Critical Tables. The authors' opinions concerning the accuracy of their results are qualitatively confirmed by the medial relation of their data to all of those previously published, and quantitatively, within the temperature range 0 to 16° C., there is remarkably close agreement with the interferometrically determined indices of water as reported by O. Jasse.

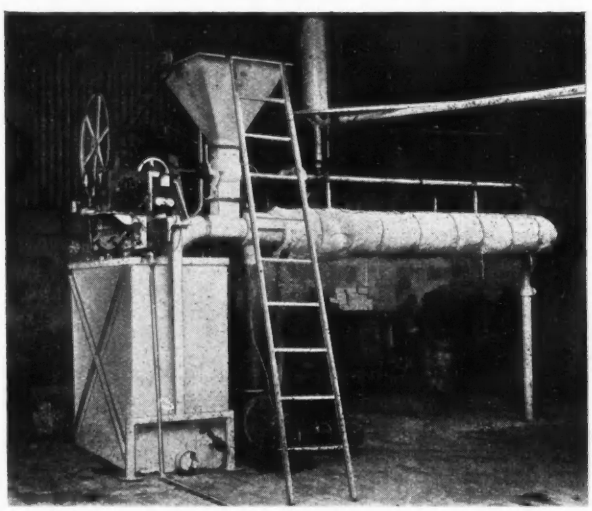
Aromatic Hydrocarbons from Lignite and Peat

Development of a New Process in France

A NEW method for the production from lignite and peat of a distillate composed mainly of aromatic hydrocarbons, has been developed in France by Francis Michot Dupont. It consists essentially of a low temperature distillation of the raw material to which calcium acetate, sodium carbonate and iron in the form of filings or oxide, have been added. It permits the transformation of the phenols, normally produced by the distillation of lignite, into aromatic substances, at the same time increasing the production of oil, and changing its characteristics to permit cracking by the usual processes.

On the basis of his experiments, Dupont has designed an oven for the application of his process. The raw material consists of lignite or peat, dried by exposure to the air, and mixed with about 2 per cent. of calcium acetate and 2 to 4 per cent. of sodium carbonate. About 0.1 per cent. of iron fillings or iron oxide acts as an activator. The exact amounts of these substances to be added, varies from one lignite to another so that the optimum amount must be determined experimentally for each lignite.

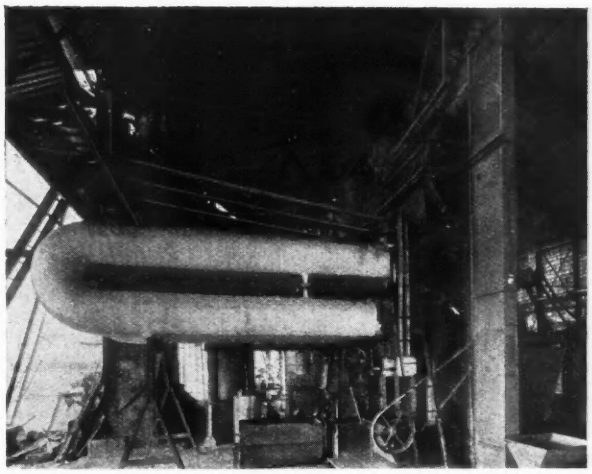
The raw material is fed into the oven by a hopper. The oven is a horizontal U-shaped tube, the two ends of which are bent down at right angles and open into a tank filled with water so that it is airtight. A chain, composed of a series of annular scrapers, made to move by a wheel, permits the raw material to be moved along the tube, from the hopper to the outlet where the coke is evacuated by gravity into a quenching bench. Heat for the distillation process is provided by a burner placed near the coke outlet. The flames from this burner run in a heatproof tube so that the movement of the flame is contra to that of the lignite. A flue placed near the admission hopper permits the evacuation of the burned gases from the flame. The gas produced by the distillation process



Small laboratory installation for the production of aromatic distillates from lignite and peat.

is evacuated by three tubes at points along its length which correspond approximately to temperatures of 150°, 350° and 600° C. in the mass of lignite. The gases escaping through these tubes are carried off for treatment. The particular form of the scrapers tends to keep the gas moving, and also avoids possible cracking of the gases and decomposition of their constituents.

The gas from the oven is cooled in a coil to precipitate the tar, which is dehydrated and distilled by the usual methods to separate heavy tar from the topping. An examination of the tars obtained shows that the phenols, creosols and xylenols normally obtained by distillation of lignite do not exist in the tars obtained by Dupont's process. Their place is taken by a series of methylated aromatic hydrocarbons. The tar



Experimental installation of Dupont plant at a lignite mine.

has a different appearance and odour from that obtained by ordinary carbonisation, and the heavier parts which remain after fractional distillation are easily cracked or hydrogenated. The exact nature and quantity of the aromatic hydrocarbons obtained, depends, of course, on the origin of the lignite used. They include benzene, toluene, xylene, cumene, trimethylbenzene, cymene and tetramethylbenzene; toluene is the most abundant, Dupont obtaining about ten times as much as is possible by ordinary carbonisation of the same lignite.

From a chemical standpoint, the reaction is very complicated and not clear. According to Professor Pascal the reaction is based on the combination of cetene with the tautomeric quinone of the phenols. The cetene is produced by the heating of the calcium acetate with water vapour. Phenol is one of the normal products of carbonisation. It exists in equilibrium with its tautomeric quinone, and this latter combines with the cetene to form a β-lactone. This in turn decomposes with a loss of carbon dioxyde and the process is completed by an intramolecular transposition.

Whitsun Tour of Dyers and Colourists

Invitation from I.C.I.

THE Dyestuffs Group of Imperial Chemical Industries, Ltd., have arranged a tour over the Whitsun week-end, in which members of the Society of Dyers and Colourists have been invited to participate. The programme planned for their entertainment includes visits to the new laboratories at Blackley and the oil from coal plant at Billingham, a tour of the Trossachs and Loch Lomond on the Sunday and a visit to the Empire Exhibition at Glasgow on Whit Monday. An afternoon trip down the Clyde has been arranged for those members who do not wish to spend a whole day in the exhibition grounds. A banquet and dance will be held at the Central Hotel, Glasgow, on Monday evening and the party will return by special train to Manchester on Tuesday morning.

Chemistry in Relation to the Rubber Industry

Papers Read at the Rubber Technology Conference

OVER one hundred papers were presented at the Rubber Technology Conference, held under the auspices of the Institution of the Rubber Industry, at Hotel Victoria, Northumberland Avenue, London, W.C.2., on Monday, Tuesday and Wednesday of this week.

S. Minatoya and T. Andô, of Heisen Yôkô Laboratory, Tokyo, described experiments which show that small proportions of *m*-dinitrobenzene, up to 1.0 per cent. on the rubber, control or limit the vulcanisation of ordinary sulphur-containing mixings to a primary period, and give vulcanisates whose resistance to bomb ageing is equal or superior to that of rubbers containing adol-α-naphthylamine. These results hold for diphenylguanidine as accelerator, but not with other accelerators. Tests have shown further that diphenylguanidine is effective in stabilising *m*-dinitrobenzene against decomposition when heated at 150° C., whereas other accelerators function as destabilisers. Other stabilising agents for *m*-dinitrobenzene are various amines, soaps and mineral oils. Ageing tests on a mercaptobenzthiazole stock containing *m*-dinitrobenzene stabilised with diphenylamine have shown improvement in ageing resistance comparable to that obtained with adol-α-naphthylamine.

Two methods for the preparation of ketone-amine condensation products were described by R. L. Sibley, of Monsanto Chemical Co., Rubber Service Laboratories Division, Nitro, W. Va. Seventy-four such compounds have been prepared and examined in a high-percentage carbon tread stock, tests being made, before and after oven ageing, on tensile strength and resistance to flexing. Sixteen of the products possessed favourable anti-oxidant properties, 24 were of moderate value only and 34 of poor effect or worthless. It is difficult to trace any general relationships between chemical sturcture and anti-oxidant effect, but the following conclusions seem justified by results. Products with the greatest anti-oxidant effect are probably derivatives of dihydroquinoline, while those of less value are probably acetone-anil types. Ortho-substituted amines condensed with various ketones, and aryl-ketones condensed with various amines are consistently weak or valueless as anti-oxidants. Acidic substituted groups have adverse effects. The best results throughout are obtained with acetone as the ketone component.

Rubber Anti-Oxidants

Apparently there is no common property running through the class products described. Ortho-substituted amines condensed with a ketone, cyclohexanone (as an example of a cyclic ketone) and aryl-ketones, such as the phenones and quinones, reacted with amines, apparently all yied products that are consistently weak or valueless as rubber anti-oxidants. Further, acidic substituted groups present in the amine or ketone yield condensation products possessing poor qualities for use as anti-oxidants. Those ketone-amine products most effective as anti-oxidants and exhibiting the greatest protection against flex cracking are shown to be condensation products of acetone with a primary arylamine, preferably aniline, or aniline substituted (meta or para) with an alkyl, alkoxy, or aryl group only. The theory is advanced that the ketone-amines of greatest effect as rubber anti-oxidants are undoubtedly derivatives of dihydroquinoline, while those of less value for this use are probably analogues of the acetone-anil type.

In a paper on the application of thermodynamics to the chemistry of rubber, N. Bekkedahl, of the National Bureau of Standards, Washington, U.S.A., gave various thermodynamic functions for purified rubber, isoprene and the reaction of polymerisation of isoprene, including the heat of the reaction, the change in entropy, the change in free energy and the equilibrium constant, calculated from data for the heats of combustion and heat capacities of rubber and isoprene. Equations have been deduced for the variation of the free energy of the polymerisation reaction with variations of pressure and temperature. The results show that below 800° K. rubber is thermodynamically more stable than isoprene, and that the reaction will proceed in the direction of formation of rubber. At any temperature below 600 to 700° K. the reaction will go practically to completion. Above 800° K. the reaction tends to go in the opposite direction, favouring depolymerisation. The free energy of the reaction determines suitable or optimum conditions under which the reaction will take place, but not the rate of the reaction. Evaluation of the free energies of formation of other substances with which rubber may react or from which it may be made will permit the conditions for these other chemical reactions to be predicted. With these conditions in view, searches can then be made for catalysts which will bring the desired reactions into equilibrium. The purpose of this paper was to show how thermodynamic data on rubber and related substances can be employed in studying and predicting their reactions.

Maleic Acid and Raw Rubber

The interaction of maleic anhydride with rubber was the subject of a paper by R. G. R. Bacon and E. H. Farmer, of the Organic Chemistry Department, Royal College of Science and the Rubber Producers' Research Association. Maleic anhydride, in presence of a small amount of benzoyl peroxide, reacts with raw rubber in solution, apparently by the addition of the maleic anhydride at the double bonds. The various ways in which this addition may occur were discussed. The benzoyl peroxide is necessary for the reaction, but appears to act only as a catalyst. Products have been obtained containing from a few per cent. up to 120 per cent of maleic anhydride calculated on the rubber. All the products differ considerably from raw rubber in physical properties, ranging from tough somewhat rubbery products through fibrous products to hard brittle resins as the maleic anhydride content increases; at the same time the products become less readily soluble in rubber solvents, but more soluble in solvents for maleic anhydride. It is considered that the maleic anhydride addition products may be of considerable technical interest on account of the variety of the products obtainable and the presence in them of active groups making possible further chemical transformations.

These derivatives are not produced by the action of maleic anhydride alone or of benzoyl peroxide alone, nor are they mixtures of rubber and maleic anhydride polymer. As a result of the reaction the rubber has been found to undergo an increase in weight ranging from a few per cent. up to about 120 per cent., according to the experimental conditions. The nature of the solvent greatly influences the extent of reaction. Determination of the iodine number of the reaction mixture shows that a loss of unsaturation in the rubber occurs during the reaction, this loss approximately corresponding with the disappearance of one double bond for each maleic anhydride molecule adding. It is suggested that the process is essentially a catalysed addition reaction, the maleic anhydride probably forming links between double bonds either in the same chain or in adjacent molecules, the double bonds thereby becoming saturated. Intermediary or secondary reactions, such as oxidation or addition by the benzoyl peroxide or internal rearrangements in the rubber molecule, occuring to a minor extent, are not altogether excluded.

Methods of cyclising rubber and the properties of cyclo rubbers were reviewed by H. P. Stevens and C. J. Miller. The effect of boron trifluoride as a cyclising agent has been investigated chiefly from the commercial point of view. Used as 50 per cent. solution in acetic acid or as fluoboric acid in various solvents, but particularly in white spirit, a specific

degree of conversion has been aimed at. Two-three per cent. boron trifluoride or 7-8 per cent. fluoboric acid gives a product which is tough, not rubbery or brittle, brushes well as a varnish and forms a hard film which can be repeatedly flexed and has superior adhesion. This material, which is alkali resistant, can be substituted for oils in paint, and so appears suitable for painting on plaster and concrete. Ordinary paints are easily destroyed by saponification of the oils. The new medium is a "breather" in that it allows the passage of aqueous solutions, whilst affording pigment protection. This has been demonstrated using an alkali sensitive pigment such as Prussian blue. Manufacture is comparatively simple, with the added advantage that as this is carried out in white spirit, the direct product in concentrations up to 50 per cent., after neutralisation and settling is ready for use as a paint medium. The paints have a slight gloss, and weathering tests indicate behaviour similar to oil paints. A tendency for the material to become brittle with the passage of time is counteracted by a specific anti-oxidant.

The converted material is less unsaturated than rubber, but is still more than twice as unsaturated as a completely cyclised rubber. It vulcanises to give a hard product resembling that obtained from rubber except that it is less thermoplastic and is an efficient adhesive for glass. This hard product contains about 12 per cent. less sulphur than a similar product obtained from rubber under the same conditions. Analyses show that the conversion product after purification contains over 4 per cent. of oxygen and is capable of combining with a further quantity either by ageing or by reaction with agents such as hydrogen peroxide. The oxidised products differ in solubility, and the amount of oxygen taken up approaches one atom for every two C_5H_8 units. An insoluble isomer of the conversion product is obtained under certain conditions.

Extraction with Acetone

In a note on the extraction of raw rubber with acetone, H. P. Stevens and J. W. Rowe pointed out that the methods of determining the acetone extract of raw rubber reported in the literature show lack of agreement on the precautions to be observed in order to obtain true values. Several investigators have reported the influence of light in accelerating the oxidation of rubber, but the necessity for excluding light, even diffused light, during the determination of acetone extracts does not seem to have been recorded. The present authors found that it was necessary to carry out extraction in the dark if accurate results are to be obtained. If raw rubbers are partly exposed to light during extraction, values 25 per cent. greater than the true ones may be obtained.

R. G. R. Bacon, E. H. Farmer and P. Schidrowitz, of the Organic Chemistry Department, Royal College of Science and the Rubber Producers' Research Association, described experiments on the preparation of artificial latices composed of polystyrene and polyacrylic esters and nitriles, conditions for these preparations being given. These latices may be mixed with rubber latex in a wide range of proportions, coagulated with acetic acid in the normal manner, and the coagula may be crêped. Mixtures containing up to 50 parts of polymeric resin per 100 parts of rubber have been uniformly coagulated, but the coherence of the coagulum decreases with increasing polymer content. Crêpes prepared from the coagula seem to be modified in structure; they dry in air much more rapidly than rubber crêpes, even with only small proportions of polymer present, and their mechanical properties vary according to the nature and proportions of the polymer used. Tests on vulcanised carbon black stocks containing various polymers show parallel modifications in mechanical properties. Polymerisation of the esters and nitrites in ammonia-preserved latex is considerably slower than in aqueous emulsion.

Synthetic resins exhibit a close general resemblance to rubber, both in the kind of molecular structures they possess and in many of their physical properties. Both synthetic resins and rubber have typical polymeric constitutions, and in solution both display colloidal characteristics. Moreover, rubber itself, under the influence of chemical reagents or heat, readily undergoes conversion into typically resinous derivatives, though usually with consequent loss or diminution of its elasticity and other valuable physical properties. Polystyrene, which may be taken as an example of a typical polymeric resin, consists, like rubber, of long carbon chains of high molecular weight; it results from the polymerisation of an unsaturated hydrocarbon and depolymerises on heating; it forms colloidal solutions in organic solvents and colloidal dispersions in water, possesses great toughness and shows an elastic after-effect when stretched. Between synthetic resins and synthetic rubbers, however, a generic relationship is even more obvious. Both kinds of products are prepared by similar polymerisation or condensation reactions; both may exist in the form of artificial latices as well as amorphous solids. A division into two classes may be made on the basis of physical characteristics rather than type of chemical structure, but no very precise line of demarcation exists.

Derivatives from Latex

Derivatives of rubber are described obtained from latex by generating nascent chlorine *in situ* or by adding bromine water, special attention being paid to compounds containing small amounts of halogen, were discussed by H. C. Baker, of the London Advisory Committee for Rubber Research (Ceylon and Malaya). Reaction with nascent chlorine proceeds exothermically, yielding white powders containing 50 per cent. chlorine which are insoluble in solvents. By preventing temperature rise, soluble products are obtained which form brittle films strongly adherent to glass and metal. Partially halogenated products can be vulcanised in the usual way, a small amount of halogen retarding vulcanisation, but the rate increasing with more halogen. Above 4 per cent. chlorine or 13 per cent. bromine, vulcanisation occurs in the presence of metal oxides, without sulphur. Chlorinated rubber vulcanisates rapidly perish in air, but the bromo-derivatives are considerably more stable and are more resistant to solvents than normal rubber vulcanisates. The hard rubber reaction is retarded by halogen in the same way as the soft rubber reaction, more halogen giving faster vulcanisation than does normal rubber. The hard rubbers are brittle, but have a higher plastic yield than ordinary rubber.

Rubber from latex that has been treated with a sufficient amount of alkali (e.g., more than 1 per cent. of sodium hydroxide) deteriorates on keeping, stated O. De Vries, of Rijkslandbouwproefstation, Groningen; the same is the case when rubber, after coagulation, is treated with a sodium hydroxide solution or with alkaline serum. The view that this deterioration is caused by the removal of a latex constituent which protected the rubber from oxidation has been found to be incorrect; it has been shown that tackiness in this case is caused by a decomposition product formed under the influence of the alkali from some latex constituent. This product, being soluble, can be removed by soaking in water. It may be assumed that this decomposition product, when causing tackiness, acts as a catalyst of oxidation, just as does copper or hydrochloric acid. The rubber hydrocarbon in *Hevea* latex does not seem to be in itself so oxidisable as to need a protective covering or a protective substance to prevent oxidation.

Experiments with Accelerators

Some experiments with accelerators of vulcanisation were described in a paper by G. Stafford Whitby and H. E. Simmons, of the Division of Chemistry, National Research Council, Canada, and the University of Akron, Akron, Ohio. As recognised accelerators of vulcanisation contain the carbodithioic group, CS.SH, or are the corresponding sulphides, compounds containing related structures have been examined, but in no case was accelerating activity found. Simple mercaptans, thioamides and dithiocarbamate esters all gave negative results. Thiodiazoles and thiodiazolines analogous to the accelerator, mercaptobenzthiazole, were found lacking in accelerating activity. From extensive experiments on the effect of various proportions of a number of organic bases in

activating ultra-accelerators, piperidine was found the most effective of those tested. Other strong bases also, however, enhance the accelerating activity. Fat acids and soaps enhance ultra-accelerator activity.

The problem of the stabilisation of chlorinated rubber provided a contribution from W. Becker, of the I.G. Farbenindustrie. Chlorinated rubber, even if prepared from purified rubber and freed from absorbed hydrochloric acid, continuously splits off traces of hydrochloric acid. This instability of the molecule, it was stated, is due to the presence of tertiary combined chlorine atoms, which are very labile. It is, therefore, necessary to adopt precautions for minimising the amount of free acid formed. Removal of absorbed hydrochloric acid from the chlorination product is important; various methods are described. Addition of basic substances to neutralise the acid split off from the molecule is unsatisfactory, because once the basic substance is used up, acid formation is accelerated owing to the change in *p*H. To avoid the change in *p*H resulting from the use of basic substances, addition of ethylene oxide derivatives has been resorted to. These do not alter the *p*H of the product, but effectively combine with any hydrochloric acid formed.

Chlorination Products

The chlorination products of rubber have, in the course of their lengthy development, acquired an important position as new lacquer raw materials. First manufactured on a large technical scale in Germany, they are to-day produced in most countries with well-developed chemical industries. The conceptions of the mechanism of chlorination and the manufacturing methods to which this gives rise are, however, very different, whilst the fields of application of chlorinated rubber have become quite clearly defined and uniformly accepted.

An improved technique for the determination of the oxidation products in vulcanised rubber was reported by A. van Rossem and P. Dekker, of Rijksvoorlichtingsdienst ten behoeve van der Rubberhendel en de Rubbernijverherd, Delft. Oxidation products may be developed during vulcanisation and during ageing. It was shown that raw rubber, when oxidising also gives a certain amount of oxidation products. Various examples were given of the importance of the determination of oxidation products in rubber articles which have to be tested for durability. This holds especially for rubber articles which cannot be subjected to mechanical testing, such as corrugated hose, mouthpieces of gas masks and so on. In such cases the determination of the oxidation products is advisable before and after accelerated ageing tests. Specifications for rubber parts of gas masks developed by the Netherlands Government Rubber Institute are based on data relating to oxidation products. Determination of the pyrrole figure, compared with those for oxidation products, showed that the latter test is to be preferred in judging the durability qualities of a rubber article.

Tests for Latex Chemicals

It is important that tests for latex chemicals shall approximate as closely as possible to a reproduction of service conditions stated C. F. Flint, of Imperial Chemical Industries, Ltd. This point is illustrated by tests used respectively for indicating effect on rate of vulcanisation, solvent resistance of latex rubber and fluid stability of the mixes. Effect on rate of vulcanisation is examined by permanent set tests, which are simple, rapid and represent the criterion of vulcanisation applied to thin elastic goods. In practice, bi-dimensional stretch is encountered. This may be imitated in tests by inflating discs on the author's film bursting apparatus designed for tensile testing, but a less complicated test employing uni-dimensional ultimate elongation gives similar results. Oil and solvent resistance may be assessed by storing discs in the fluid before applying the film bursting test, or by a rupture test made by dropping the fluid on to a test disc distended by suction in the same apparatus. Permeability of the films is tested by coating paper thimbles internally with the latex mix and then standing them filled with the oil or solvent. The efficacy of stabilisers is compared by determining the amounts required to give a latex which can be heavily compounded under stirring, stored for a standard time and then applied to cloth to give smooth spreadings.

New Ulster Industry

Large Industrial Alcohol Project

POWER alcohol is to be produced in Northern Ireland at a factory which, when it is completed, will be one of the finest of its kind in the world. The erection of the plant will begin almost immediately, and it is expected that production will begin in twelve months time. The new industry will at first provide work for 300 men, but that number will be greatly increased as ancillary activities are developed.

The promoters of the scheme, an important Anglo-American group, anticipate that the availability of low-priced industrial alcohol in Northern Ireland will attract to the country a number of other new industries in which this raw material is employed. The completion of an agreement as to the extent of the financial assistance to be provided by the Northern Ireland Government towards the establishment of the alcohol plant is announced by Sir Roland Nugent, chairman of the Ulster Development Council. The agreement has been concluded under the terms of recent legislation designed to attract new industries to Northern Ireland.

Unlevel Dyeing of Wool

Investigation of Effects of Exposure

A COMPLETE investigation of unlevel dyeing of wool caused by exposure, either during growth or in fabric form, is reported by Rack, Rowe, Speakman and Vickerstaff (*J. Soc. Dyers and Colorists*, 1938, *54*, 141-172).

It was found that the result of exposure which produces unlevel dyeing is the hydrolysis of cystine links in the peptide chains of the wool, whereby sulphydryl and sulphenic acid groups are produced, the latter decomposing further with loss of sulphur to give carbonyl groups. The parts thus damaged swell to a greater extent than the unexposed parts when immersed in a dyeing bath, thus becoming more accessible to colloid dyes and being dyed a darker shade by them. Crystalloid dyes may dye level on such fabric, but unlevelless, is liable to develop on after-chroming, due to reduction of the chromium by the sulphhydryl and carbonyl groups, resulting in easier stripping of the dye from the damaged parts.

Level dyeing can be obtained with any dye, prior to chroming, by suitable adjustment of the acidity of the dyebath, whereby the degree of dispersion of the dye is either increased or decreased. However, this is not a complete remedy, since, as stated, unevenness may develop on after-chroming. If the fabric is treated with cyanamide the reducing groups are blocked by the formation of complexes with them, so that reduction of chromium does not occur. This treatment, while preventing the development of unevenness on after-chroming, does not diminish the necessity for adjusting the degree of dispersion of the dye.

A better method is to treat the material with chromium acetate, which forms both addition compounds with the reducing groups, blocking them and also links between the peptide chains, whereby the tendency of the exposed portions of the fibre to swell in dyebaths is reduced and they are rendered almost identical in mechanical properties with the undamaged portions. This treatment reduces considerably the need for adjusting the degree of dispersion of the dye. The fabric should be immersed for half an hour in a 3 per cent. solution of basic chromium acetate, containing 4 per cent. of acetic acid, the temperature being 40°C. The liquor wool ratio should be 50/1.

Separation of Industrial Minerals

Extended Studies of Flotation and Agglomeration

INFORMATION which should be of practical value in simplifying and cheapening the production of many of the non-metallic or "industrial" minerals used in the manufacture of numerous commercial products has been developed by the United States Bureau of Mines, as the result of extended studies of the flotation and agglomerate concentration of these minerals. Among the minerals studied are phosphate rock, barite, magnesite, calcium and strontium. Results of the investigation are summarised in a paper by O. C. Ralston, chief engineer of the Non-metals Division, recently published by the Bureau.

The two main filming methods used for mineral concentration are reviewed in their application to the non-metalliferous minerals from alunite to zircon. Agglomerate tabling is a division of the subject that is little known, even to flotation men, and is, therefore, of timely interest. Agglomeration is practiced at present only on sands suitable for gravity tabling and does not apply with so much success to the finer sizes. After filming the desired minerals with a suitable flotation collector the film is enhanced with non-saponifiable oils like petroleum to the point where the oiled particles stick together in agglomerates of sufficient size to be caught in the cross-water of a concentrating table and washed away from the unagglomerated mineral particles. The process has been applied mainly to materials like Florida pebble phosphate and to beach sands, where no grinding is needed and slimes carry little or none of the desired mineral.

The non-metallic minerals usually require flotation collectors of a different type from those used for sulphide ores. While a few non-metallic minerals, like sulphur and graphite, can be collected by use of xanthates and the phosphocresylates, most of them can be classed as basic or acidic minerals. Basic minerals can be collected with reagents where the complex and more lyophobic ion is the anion, as in soaps. Thus, nearly any calcium, magnesium, strontium or barium mineral can be filmed with insoluble soaps by using fatty acids or their salts as collectors, or by use of the sulphonated or other type wetting agents in common use as soap substitutes. This class of flotation separation is called "soap flotation." The acidic minerals, like the silicates and quartz, respond best to reagents carrying a complex-water-repellant cation, such as an amine with a substituent of sufficiently long or complex structure to make it tend towards water repellance.

The paper to which reference is made also lists with each mineral the pulp modifiers, activators, deactivators and depressants that have special selective action on each of these minerals or the gangue which accompanies them. Designated as Report of Investigations, 3397, "Flotation and Agglomerate Concentration of Non-metallic Minerals," copies may be obtained from the Bureau of Mines, Washington, D.C.

Chemical Matters in Parliament

Imports and Production of Chemical Compounds

IN the House of Commons on May 20, Mr. David Adams asked the President of the Board of Trade if he would give statistics as to the quantities and values of the following chemical compounds produced and consumed in the United Kingdom and also in other areas within the British Empire in the most recent year for which figures are available: Salvarsan, Bayer 205, tryparsamide, atebrin, plasmoquin, trypan-blue and trypaflavin?

In reply, Mr. Cross said: During 1935, the latest year for which the information is available, the output in the United Kingdom of salvarsan and neo-salvarsan and other organo-arsenic compounds of like medicinal application mounted to 7,900 lbs., of a selling value of £107,000. No other official information is available regarding output or consumption of the substances in the United Kingdom or the British Empire.

Mr. David Adams then asked the President of the Board of Trade if he would give statistics as to the quantities and values of the following chemical compounds imported into the United Kingdom and also into other parts of the British Empire in the most recent year for which figures are available: Salvarsan, Bayer 205, tryparsamide, atebrin, plasmoquin, trypan-blue and trypaflavin?

In reply, Mr Cross said: Import of the commodities mentioned in the question are not separately recorded for the purpose of the published trade returns of the United Kingdom. Particulars in respect of salvarsan and neo-salvarsan and other organo-arsenic compounds of like medicinal application were, however, separately recorded up to the year 1933, in which year imports into the United Kingdom amounted to 69 lb., valued at £3,296. He had no information as to imports of these commodities into other parts of the Empire.

Grant for Research on New Chemical Compounds

On May 24, Mr. D. Adams asked the Chancellor of the Duchy of Lancaster whether his attention had been drawn to the fact that in war the British Empire would be without access to important chemical compounds of which Germany had a virtual monopoly; whether he was aware that German firms producing these chemical agents did not as a rule grant licences for manufacture in this country; and whether any Government action was contemplated in view not only of possible war-time contingencies, but also of the continuous and urgent needs of the British tropical Empire?

In reply, Earl Winterton said: The Lord President is well aware of the fact that the discovery of new chemical compounds of certain kinds, particularly those which can be used in the treatment of some tropical and other diseases, at present depends largely on research work undertaken by industrial concerns in Germany, with the consequence that supplies of these new substances can for a longer or a shorter period be obtained only from abroad. It is for this reason that the Government have approved the proposal of the Medical Research Council for expenditure at the rate of £30,000 per annum on research in chemotherapy, to enable this country to play a greater part in future in making new discoveries in this field.

Power Alcohol from Molasses

Progress in India

WITH the rapid growth of the sugar industry in India and the consequent necessity for finding outlets for the by-products, there has been an incessant urge from sugar interests for the production of power alcohol from what are now the waste products of sugar. The Imperial Council of Agricultural Research and the Imperial Institute of Sugar Technology at Cawnpore have been constantly urged to undertake the work from the stage of experimentation to that of established manufacture, as a measure of assistance to the industry. Private enterprise has, however, already established an experimental plant at Lahore.

In pursuance of the recommendations of a joint conference of the sugar representatives of the United Provinces and Bihar—provinces which between them include some 85 per cent. of the country's sugarcane resources—the Government of the United Provinces, in consultation with the Government of Bihar, have appointed a committee to devise ways and means of starting the manufacture of power alcohol from molasses and to report on the best methods of manufacturing power alcohol and mixing it with petrol.

The experience of distilleries that manufacture power alcohol in India is that it will be possible to produce power alcohol at about Rs. 0-7-6 per gallon if the price of molasses be taken at Rs. 0-4-0 per maund; this figure could be appreciably reduced in distilleries making industrial and power alcohol. It is also felt that it would be very essential to develop an internal source for supply of petrol.

The Production of Radium in Canada

Refinery Progress at Port Hope, Ontario

CANADA'S chief producer of radium, Eldorado Gold Mines, extracted 23.8 grams of the element during 1937. Bearing in mind that expansion work necessitated the closing down of the plant during the last quarter of the year, the average production was about 2.6 grams monthly during the period of operation. Recent extensions at the plant, however, have increased the capacity at Port Hope to 9 grams per month, but it is not expected that this rate will be actually attained until November, 1938.

According to an article in the April issue of *Canadian Chemistry and Process Industries* (Toronto), the first stage in the wet processing of the pitch-blende concentrate received from Great Bear Lake is a strong acid treatment. A preliminary roasting is necessary, and the plant which has been erected has a roasting capacity of about five tons daily. In order to render the native and complex silver in the ore suitable for wet extraction by sodium cyanide or hyposulphite, the ore from the roaster is treated with salt in reverberatory furnaces, resulting in the production of silver and uranium chlorides. Two new furnaces have taken the place of the single reverberatory in the old roast house, and these new furnaces will have, together, three times the capacity of the original furnace. Consideration is being given to the eventual recovery by electrical precipitation of by-products from the gases of the roasting furnaces.

The Leaching Operation

In the main radium processing building the radium separation process operates on vertical lines, leaching being carried out on the top or fourth floor. The vertical lifting of roasted ore is done by elevator. The capacity of the radium plant from leaching units onwards has been tripled. In some instances it has been more economical to instal one large piece of equipment instead of several shall units, but on the whole the aim has been to insal three units, each equal in normal capacity to the one in the original refinery plant. It is expected that the new plant will handle 150 tons per month, operating with three shifts, if necessary, but a more probable level of production will be somewhere in the range of 50 to 100 tons per month.

The chief stage in the process is the leaching operation. A leaching unit consists of two stoneware vessels, two lead catch tanks and three stoneware vacuum filters. Sulphuric acid, diluted one to one, with water is used in the leaching process. Sodium nitrate, barium chloride and hydrochloric acid are also added during the leaching, the first to oxidise the uranium solution, the second to provide the additional barium sulphate to carry the radium and the third to take care of any soluble silver.

Recovery of Silver

The uranium liquor from the leaching operation is filtered and passes off to wooden storage tanks on the floor below, prior to transfer to the uranium building. The insoluble sulphate residue, containing the radium, barium, silver, lead, silica and some calcium, is assayed for silver and agitated in steel revolving drums for three hours with the necessary amount of sodium hyposulphite.

The silver is precipitated from the liquor as silver sulphide by the addition of sodium sulphide. This silver sulphide is dried, ground and taken to silver refineries. The radium-bearing residues contain 12 to 18 per cent. of lead sulphate, which is removed in solution by boiling in open steel kettles for one and one-half hours with caustic soda and filtering. The insoluble residue from this last operation, containing silica, radium and barium, is carbonated with soda ash in two steam jacketted steel autoclaves. The carbonated material is filtered off, washed, acidified and boiled with hydrochloric acid in stoneware or Haveg kettles. On filtration in stoneware suction filters a residue of silica is left and the radium and barium are present in the filtrate as chlorides. On agitation with sulphuric acid in stoneware agitators a concentrate of barium-radium sulphate is obtained.

The radium-barium sulphate is converted into carbonates by boiling with soda ash in steel kettles, and the carbonates of radium and barium are converted into chloride by treatment with hydrochloric acid. The chlorides are purified with ammonia, filtered in a Haveg suction filter, and the purified chlorides are reprecipitated with sulphuric acid in an agitated tank. The barium-radium sulphates are converted again into carbonates, which are passed to the laboratory for transformation into bromide liquors for the fractional crystallisation process, by which the radium bromide is separated from the barium bromide.

In the new uranium building, not yet completely equipped, the alkaline uranium liquor is brought from the radium building to one of four large steel tanks of about 7,000 gallons capacity each.

The system of refining employed at Port Hope uses a large quantity of chemicals, the ratio being seven tons of chemicals to one ton of concentrate. The quantity of radium-barium concentrate is about 1.5 per cent. of the weight of the original ore treated. The percentage of recovery of the radium itself is now about 95 per cent., and it is anticipated that even this fine figure will be improved upon.

Fractional Crystallisation

The crystallised fractioning process utilises the difference of solubility of the radium and barium in water. A crop of crystals is secured, gradually becoming richer in radium and poorer in barium. From an initial solution of bromide, which has a ratio of one part radium to 400,000 parts of barium, the crystals are gradually brought to a ratio of nine parts of radium to one of barium, at which point they are removed from the system and transferred into glass tubes, which are placed in a lead safe. In continuous operation it is possible to produce the finished radium in about fifteen days, starting from the sulphate concentrate, but it usually takes about two months for the complete preparation of the radium for commercial use.

The plant now employs about 80 men, of whom 65 are permanently employed. A report by the "Northern Miner" (Toronto), on a recent visit to the refinery, mentions that the pant is at present producing slighty under $100,000 per month in radium and by-products.

Drying Air with Calcium Chloride

An Industrial Application

THE French firm of Solvay have been carrying out experiment on the possibility of drying air with calcium chloride for commercial and industrial purposes. Calcium chloride drying has hitherto been used only on a small scale.

An apparatus has been designed consisting of an upright cast iron cylinder divided into two sections by wire netting. The upper part contains the chloride in lumps and a pipe leads the air into the lower part. This pipe enters the side of the cylinder just below the netting partition and is bent so as to lead the incoming air to the bottom of the cylinder, so that in rising it will come evenly into contact with the whole surface of the chloride in the top of the cylinder. Part of the moisture contained in the air will be absorbed by the chloride and eventually chloride solution will drip into the bottom of the cylinder. As this chloride solution fills the lower part, the air entering the apparatus is obliged to bubble through it before reaching the lumps of chloride in the upper part, in this way effecting a pre-drying.

Personal Notes

MR. GEORGE E. PEARSON has been elected an honorary auditor of the Pharmaceutical Society in the place of the late Mr. T. E. Lescher. He is governing director and chairman of The Wellcome Foundation. In 1937 he received the honour of La Croix de Chevalier de la Legion d'Honneur from the President of the French Republic.

DR. SIDNEY SIEGEL, of Columbia University, has been awarded a Westinghouse research fellowship for 1938-39. He hopes to develop methods of growing single crystals of pure metals and of alloys which show order-disorder transitions, for the purpose of studying how the elastic properties of alloys depend upon the arrangement of the atoms in the crystal lattice.

DR. T. A. TOWNEND, D.Sc. (London), has been elected to succeed Professor J. W. Cobb, in the Livesey Chair of Coal, Gas and Fuel Industries, at Leeds University. Dr. Townend entered the East London College of the University of London after four years of war service, and graduated in 1920. He then went to the department of chemical technology at the Imperial College of Science, London, for post graduate study and research under Professor W. A. Bone. He was awarded successively a Salters' research fellowship and a Rockefeller international research fellowship. He is now an authority on combustion and high pressure problems, and has been largely concerned in equipping and organising the high pressure laboratories at the Imperial College of Science.

PROFESSOR JOHN JACOB ABEL, of Baltimore, who is director of the laboratory for endocrine research at the John Hopkins Medical School in the United States, has been elected a foreign member of the Royal Society. He is well known for his researches on adrenaline, pituitrin, insulin and the pharmacological action of the phthaleins.

DR. FRANCIS C. KELLY will undertake research work on the agricultural, medical and industrial applications of iodine, when he takes up his new post with the Nitrate Corporation of Chile, in London. At present he is deputy director of the Imperial Bureau of Nutrition at the Rowett Institute, Aberdeen.

PROFESSOR ARTHUR SMITHELLS, who was director of the Salters' Institute of Industrial Chemistry from 1922 until his retirement in 1937, has been presented with a set of silver beakers, suitably inscribed, by a group of Fellows of the Institute, in appreciation of the advice and assistance which Professor Smithells rendered during his term of office. Professor Smithells was the recipient of the Harrison memorial medal of the Pharmaceutical Society of Great Britain in 1935.

OBITUARY

MR. CHARLES PRESTON PEAK, a retired chemical manufacturer and a partner of John Peak and Co., Ltd., Bridgewater, Chemical Works, Wigan, until his retirement in 1900, died at Southport on May 15, at the age of 85.

Chemical Notes from Foreign Sources

Jugoslavia

ORES WITH A HIGH PLATINUM CONTENT are reported to have been located in the vicinity of Derventa.

Poland

A SALES CARTEL FOR SODIUM PERBORATE has been formed by the Electrogesellschaft A.G., of Warsaw, and the Hugohütte Chemische Werke, of Tarnowitz.

Hungary

A RECENT HUNGARIAN PATENT CLAIMS that powdered corncobs improve the mechanical-detergent action of soaps when present in the proportion of 10 to 75 per cent.

Belgium

AN AREEMENT HAS BEEN REACHED between Photo-Produits Gevaert S.A. and the Union Chimique Belge S.A., whereby the latter will restrict its activities in the photographic industry to the manufacture of raw materials for photochemical products.

France

A FACTORY FOR MAKING TETRAETHYL LEAD is under construction at Paimboeuf by the "Service des Poudres," who will operate an American process.

PRODUCTION OF SHALE OILS and their large-scale hydrogenation is to be undertaken by the Soc. Chimique de la Grande Paroisse, of Paris, in the Department of Allier.

Japan

A CHEAP PROCESS FOR BLEACHING RAYON with ozone has been developed by the Japanese Ozone Gas Co. in collaboration with leading textile concerns.

CASEIN FROM SOYA BEANS will be the raw material for artificial wool manufacture by a Japanese concern which has acquired the lanital patent rights for that country. Production of soya bean casein is being developed by a group of firms, including the Japanese Electroindustry Co., the Japanese Oil and Fat Co. and the Honen Oil Co.

Sweden

BENZOIC ACID SULPHIMIDE is being made by the A.B. Astra, of Södertälje, and sold as a sweetening agent under the name of "krystallose."

FURFURAL IS NOW BEING PRODUCED on a moderate scale (1,000 tons per annum) by the A.B. Tannin, of Vaptervik. This output more than covers the consumption of Swedish oil refineries.

Russia

IMITATION MARBLE IS TO BE MADE on a large scale from asbestos sheet, white cement and a nitrocellulose lacquer. The planned output for this year at the "Krasny Stroitelj" factory in the Moscow district is over 50,000 square yards, which is to be increased tenfold in 1939.

Ten Years Back

From "The Chemical Age," May 26, 1928

THERE is only one important producer of sulphur in Chile, the firm of Espada and Donoso, of Santiago, which operates in the vicinity of Tocora. It is estimated that the firm produces about 90 per cent. of the domestic output.

* * * *

The percentages of workers recorded as unemployed on April 23 in chemical manufacture in Great Britain and Northern Ireland was 5.9 per cent. (6.7 per cent. males, 3.4 per cent. females); in explosive manufacture 5.5 per cent. (5.6 per cent. males, 5.4 per cent. females); in paint and varnish manufacture 4.1 per cent. (4.5 per cent. males, 2.8 per cent. females).

* * * *

The directors of Imperial Chemical Industries, Ltd., in their first annual report to the shareholders regard the results of the first year's operations as "very satisfactory." In view of the heavy costs of organisation and the difficulty of co-ordinating the operations of four such great units, this opinion will be generally endorsed. The profit amounts to £4,576,225.

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Sodium polyphosphate. Andress and Wüst, *Z. anorg. Chem., 237,* 113-131.

Beryllium. Sawyer and Kjellgren, *Ind. Eng. Chem., 30,* 501-505.

Dissolution of aluminium and aluminium alloys in soda lye. Müller and Löw, *Aluminium (Germany), 20,* 257-263.

Electrolysis: plant design and operation. Ellingham, *Ind. Chem., 14,* 180-186.

Organic

From turpentine oil to terpineol. Fornét, *Seifensieder Ztg., 65,* 223-224.

Electrical discharge in gaseous hydrocarbons. Lind and Schultze, *J. Phys. Chem., 42,* 547-558.

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Chemical purification of crude acetylene. Scherun, *Chem. Fabrik, 11,* 207-209.

Catalysts in hydrocarbon chemistry. Rideal, *J. Inst. Petroleum Techn., 24,* 221-224.

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Analysis

Separation of sulphur dioxide and sulphur trioxide in waste gases from sulphuric acid plant. Lohfert, *Angew. Chem., 51,* 228-231.

Determination of nitrogen in proteins and organic matter. Dumazert and Marcelet, *Bull. Soc. Chim. Biol., 20,* 201-211.

Sulphur determination in inorganic substances. Schöberl and Senf, *Z. analyt. Chem., 112,* 171-174.

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Indicators in acidimetry and alkalimetry. Malaprade, *Annal. Chim. Analyt., 20,* 89-94.

Titrometric determination of phosphoric acid. Rathje, *Angew. Chem., 51,* 256-258.

Microscopical fibre analysis. Noll, *Papier Fabrik. (techn. (Teil), 36,* 133-135.

Analysis of caseins. Delorme, *Rev. Générale Matières Plastiques, 14,* 109-110.

Mineral Oils, Gas, Tar

Polymerisation of butenes by solid phosphoric acid catalyst. Ipatieff and Schaad, *Ind. Eng. Chem., 30,* 596-599.

Chemical production of liquid fuels. Galle, *Petroleum Z., 34,* No. 19, 1-12.

Evaluation of bituminous mixtures. Kamptner, *Bitumen, 8,* 77-84.

Cellulose, Paper

Single stage manufacture of viscose. Clemens, *Rev. Univ. Soie Text. App., 13,* 9-13.

Structure of cellulose hydrate. Hermans, *Kolloid Z., 83,* 71-83.

Trimethylated cellulose from wood pulp. Bell, *Biochem. J., 32,* 699-701.

Fireproofing of wood. Peschek, *Osterreichische Chem. Ztg., 41,* 179-182.

Chemistry of cellulose derivatives. Conaway, *Ind. Eng. Chem., 30,* 516-523.

Bleaching, Dyeing, Finishing

Deposition of rubber onto textile fibres. Blow, *J. Soc. Chem. Ind., 57,* 116-124.

Wetting agents, emulsifying agents and detergents. Ryère, *Text. Imp. Blanch. App., 16,* 193-201.

Cellulose acetate rayon fibres. Smith, *Amer. Dyestuff Rep., 27,* P213-217.

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Textile printing assistants. Hall, *Canadian Text. J., 55,* 37-39.

Bleaching action of hydrogen peroxide on wood. Campbell and Swann, *Biochem. J., 32,* 702-707.

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Latex in the textile industry. Bonnet, *Teintex, 3,* 290-295.

Glass, Ceramics

Glass for scientific and heat resisting purposes. Turner, *J. Soc. Glass Techn., 22,* 28-42.

Identification of crystalline products in commercial glasses. Holand and Preston, *Glass Rev., 14,* 54-58.

Selenium red and selenium ruby. Pongratz, *Glashütte, 68,* 299-300.

Chemistry of clay. Carlsohn and Müller, *Ber., 71,* 858-870.

Metals, Electrometallurgy

Constitution of magnesium-rich alloys. Hume-Rothery and Raynor, *Monthly J. Inst. Metals, 5,* 203-228.

Influence of oxygen on the ageing of iron and steel. Wilder, *Metals and Alloys, 9,* 119-123.

Corrosion of magnesium alloys. Endo and Morioka, *Aluminium, 3,* 183-188.

Rubber linings in the electroplating industry. Harkins, *Metal Ind. (U.S.A.), 36,* 225-228.

Fats, Oils, Waxes

Bleaching of palm oil. Wittka, *Seifensieder Ztg., 65,* 235-237.

Soft soaps. Davidsohn and Davidsohn, *Soap Perfum. Cosmetics, 11,* 437-441.

Chemistry of butter and margarine. Erlandsen, *Fette u. Seifen, 45,* 215-219.

Catalytic hydrogenation of fats. Kaufmann and Pardun, *Fette u. Seifen, 45,* 223-228.

Micro-determination of the saponification number. Furter, *Helv. Chim. Acta, 21,* 601-613.

Paints, Pigments, Resins

Temperature fluctuations and the viscosity of lacquers and paints. Rasquin, *Farben Chem., 9,* 118-119.

Drying of linseed oil paint. Nicholson and Holley, *Ind. Eng. Chem., 30,* 563-565.

Synthetic resins in printing inks. Krumbhaar, *Rev. Générale Matières Plastiques, 14,* 103-106.

Determining the melting point of resins. Fourobert and Brückel, *Farben Ztg., 43,* 497-498.

Rubber, Plastics

Researches in Pastics. Caoutchouc et Gutta Percha, *35,* 113-115.

Preservation of rubber insulation in electric cables. Bongrand, *Rev. Générale Caoutchouc, 15,* 91-94.

Miscellaneous

Heat exchanges for chemical processes. Millett, *Ind. Eng. Chem., 30,* 367-372.

Acidity in tannin extracts. Ponte, *J. Intern. Soc. Leather Trades' Chem., 22,* 172-181.

Solid adsorbants in the sugar industry. Akermann, *Bull. Assoc. Chim., 55,* 287-297.

Drum drying. Harcourt, *Chem. Met. Eng., 45,* 179-182.

Filtering gas through glass. Atkinson, *Chem. Met. Eng., 45,* 176-178.

Accident prevention in chemical industry. Rheinfels, *Chem. Fabrik, 11,* 210-215.

Finely divided materials and their technical applications. Auerbach, *Chem. Fabrik, 11,* 205-207.

Lignin sulphonates in the manufacture of lubricating soaps. Meier, *Seifensieder Ztg., 65,* 275-277.

Mixing of emulsions. Cheesman and King, *Kolloid Z., 83,* 33-37.

From Week to Week

THE BRITISH OXYGEN CO., LTD., are to erect premises at Chester-le-Street.

DAMAGE AMOUNTING TO £2,000 was caused by a recent outbreak of fire at the Arden Lime Works, Nitshill, Renfrewshire, belonging to Allan Kirkwood, Ltd.

THE ELECTRODEPOSITORS' TECHNICAL SOCIETY is considering the issue in the near future of an official register containing the names and addresses of all members of the Society. It is proposed that this register be circulated privately among members only.

CENSUS FORMS ARE TO BE SENT OUT by the Government on May 28 relating to machinery employed in the production of woven and knitted fabrics, but dyeing and finishing plant will not be included.

A LARGE ALUMINIUM REFINERY is to be established shortly at Iwabuchi, Shizuoka Prefecture. The capital is being provided by the Tokyo Electric Light Co. and the Mitsui, Mitsubihsi and Sumitomo concerns. The refinery will aim at an annual output of 50,000 tons.

THE TEXTILE INSTITUTE has kindly issued an invitation to the members of the Society of Dyers and Colourists to attend its 28th annual conference to be held at Peebles, June 21 to 25. Further information may be obtained on application to The Secretary, Society of Dyers and Colourists, 32 Piccadilly, Bradford.

BURGESS, LEDWARD AND CO., LTD., of Walkden, Lancashire, have perfected the production of a new artificial wool fabric which may help the British textile industry to compete against artificial wool cloth as now made in Italy and Germany. The new cloth is an adaptation of a mixture of synthetic fibres on the viscose basis.

A REPRESENTATION HAS BEEN MADE to the Board of Trade under Section 10(5) of the Finance Act, 1926, regarding alpha naphthyl isothiocyanate. Any communication should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, London, S.W.1, before June 4, 1938.

THE FIRST BRITISH STANDARD SPECIFICATIONS for Tarmacadam (B.S.S. No. 802-1938) have just been published. These specifications have been based on proposals that were originally prepared by the British Road Tar Association, and in their task they received the close co-operation of the road-stone and slag industries and the Road Research Laboratory.

THE BOARD OF TRADE announce that the Treasury have made an order under Section 10(5) of the Finance Act, 1926, exempting meta-oxyacetophenone from Key Industry Duty from May 25, 1938, until December 31, 1938. The Treasury Order, which will be entitled The Safeguarding of Industries (Exemption) No. 2 Order, 1938, will shortly be published by the Stationery Office.

J. W. TOWERS AND CO., LTD., have issued a leaflet (No. 42) showing their new streamline hydrometers, the design of which is entirely new to this country. These hydrometers have a glass disc fused into the bulb of the hydrometer to form a compartment for the shot or mercury counterpoise; this makes the hydrometer less liable to breakage, more easily cleaned, and causes it to come to rest more rapidly.

THE BRITISH RUBBER PUBLICITY ASSOCIATION has now taken over the activities hitherto carried out for a number of years by the Rubber Growers' Association in connection with propaganda and publicity for rubber products and the development of new uses for rubber. Correspondence dealing with these matters should now be addressed to the Secretary, British Rubber Publicity Association, 19 Fenchurch Street, London, E.C.3.

THE BRITISH STANDARDS INSTITUTION will hold its annual general meeting at the Dorchester Hotel, Park Lane, London, W.1, in the morning on June 14. The meeting will be followed by a luncheon. Captain D. Euan Wallace, M.C., until recently Parliamentary Secretary to the Board of Trade, was to have been the chief guest, but his place will now be taken by his successor, Mr. Ronald H. Cross, M.P., the new Parliamentary Secretary to the Board of Trade.

THE GEIGY COLOUR CO., LTD., announce the introduction of Tinon Chlorine Olive 2B fine powder for dyeing, and Tinon Chlorine Olive BG powder. The former is a fairly bright olive green of outstanding general fastness properties, for the fast dyeing of cotton and cellulose rayon. On account of its good properties it is most suitable for dyeing tapestry and furnishing materials and in general for all fabrics requiring maximum fastness to light. Its good fastness to soda boiling and chlorine renders it also applicable for coloured discharge goods (soda boiling and chlorine process or combined chlorine and peroxide bleach). Tinon Chlorine Olive BG powder gives a rather duller shade which is fuller and richer than the 2B brand.

AT THE ANNUAL CONFERENCE of the National Union of Dyers, Bleachers, and Textile Workers at Blackpool on May 23, a resolution pressing for holidays with pay was carried unanimously.

GOO-GOO PRODUCTS, LTD., manufacturers of and dealers in cleaning materials, Sapphire Chemical Works, Whieldon Road, Stoke-on-Trent, have increased their nominal capital by the addition of £1,000, in £1 ordinary shares, beyond the registered capital of £500.

THE BRITISH CHEMICAL PLANT MANUFACTURERS' ASSOCIATION have reprinted their annual dinner-discussion on "Organisation of Research in a Works." It is available to non-members at a price of 1s. per copy, post free, at the offices of the B.C.P.M.A., 166 Piccadilly, London, W.1.

UNFORESEEN COLLAPSE OF FOREIGN TRADE, owing to international troubles and loss of the American and Canadian markets, has spoiled the record of Lee Moor, the china clay centre on the fringe of Dartmoor, which for many years has been known as one of the few villages in England without any unemployment.

ACCORDING TO STATISTICS published in the May Bulletin of the International Tin Research and Development Council, world production of tin in the first quarter of the current year was 43,200 tons, against 46,300 tons in the first quarter of 1937. The preliminary figure of world production for March, 1938, is 16,300 tons, against 13,000 tons in February.

ONE OF THE LARGEST RUBBER MANUFACTURING CONCERNS in America, the B. F. Goodrich Co., had to close its five plants at Akron, Ohio, on May 20, after a walk-out of employees in protest against the retention of eight apprentice electricians when men of longer service were without employment. About 6,500 men were rendered idle by the strike.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Companies Winding-up Voluntarily

LAVENDER BROS. AND CO. (DEHYDRATIONS), LTD. (C.W.U.V., 28/5/38.) Creditors' claims by June 30, 1938, to Harry Sharp, 30 Brown Street, Manchester, liquidator.

DEHYDRATION, LTD. (C.W.U.V., 28/5/38.) By special resolution May 12, S. W. E. Blackall, 8 Marble Hill Gardens, Twickenham, Middlesex, appointed liquidator.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GLASSO PAINT PRODUCTS, LTD. (formerly British Glasurit, Ltd.), Perivale. (M., 28/5/38.) May 12, mortgage to Halifax Building Society, securing £14,550 and further advances; charged on land and factory at Wadsworth Road, Perivale, etc. *Nil. Aug. 6, 1937.

HOWARD-PRICE, LTD., Lincoln, tar distillers. (M., 28/5/38.) May 14, £3,000 debenture, to E. Nickerson, North Ormsby; general charge (subject to etc.). *£2,000. May 4, 1937.

NOBLES AND HOARE, LTD., London, S.E., varnish manufacturers, etc. (M., 28/5/38.) May 11, Land Registry charge, to Midland Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and buildings at Holmes Terrace, Pear Tree Street and 127, 128 and 129 Cornwall Road, etc. *Nil. May 4, 1938.

SOYA BEAN CULTIVATION AND BY-PRODUCTS, LTD., Ewelme. (M., 28/5/38.) May 11, £2,150 mortgage, to H. H. B. Walton, London, and another; charged on Potters Farm, Benson, and Ewelme and cots., etc.

County Court Judgments

CALOTHERM MANUFACTURING CO. (firm), 280 Vauxhall Bridge Road, S.W., manufacturing chemists. (C.C., 28/5/38.) £22 9s. 6d. March 22.

VARKOFF PROPRIETARIES, LTD., R.O., Hipsley House, Carnarvon, manufacturing chemists. (C.C., 28/5/38.) £15 9s. 2d. April 6.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

MANUFACTURE OF COMPOUNDS.—H. D. K. Drew, D. B. Kelly, and Imperial Chemical Industries, Ltd. 12784.

TREATMENT OF ELECTRODEPOSITED ZINC COATINGS.—E. I. du Pont de Nemours and Co., and R. O. Hull. 12782.

REMOVAL OF CARBON DEPOSITS resulting from fuel combustion. Eclipse Aviation Corporation. (United States, May 5, '37.) 13317.

UREA-FORMALDEHYDE MOULDING-POWERS.—J. Ferguson and Sons, Ltd., J. E. Ferguson, and S. A. Ede. 12890.

METHODS, ETC., FOR FROTHING LATEX.—Firestone Tyre and Rubber Co., Ltd. (United States, May 8, '37.) 13304.

PROCESS FOR PURIFYING GASES.—Gas Light and Coke Co., and G. J. W. Anderson. 12655.

HYDROGENATION OF ORGANIC MATERIALS, ETC.—A. G. Hellicar, A. W. C. Taylor, and Imperial Chemical Industries, Ltd. 13215, 13216.

SEPARATION, ETC., OF PULVERISED MATERIALS.—E. B. Higgins. 12757.

ELECTROLYTIC PROCESSES.—S. Horrobin, R. G. A. New, and Imperial Chemical Industries, Ltd. 13217.

MANUFACTURE OF WATER GAS.—Humphreys and Glasgow, Ltd., and J. H. Smith. 13033, 13034.

MANUFACTURE OF ALIPHATIC KETONE-ANILS.—I. G. Farbenindus-(Germany, May 27, '37.) 13147.

PRODUCTION OF CALCIUM HYPOCHLORITE COMPOUNDS.—I. G. Farbenindustrie. (Germany, June 8, '37.) 13366.

PRODUCTION OF STARCH GRITS.—International Patents Development Co. (United States, June 17, '37.) 12766.

PRODUCTION OF DEXTROSE HYDRATE.—International Patents Development Co. (United States, May 14, '37.) 12768.

DECOMPOSITION OF METAL CARBONYLS.—G. W. Johnson (I. G. Farbenindustrie.) 12705.

SEPARATION OF NICKEL AND COPPER.—G. W. Johnson (I. G. Farbenindustrie.) 12706.

MANUFACTURE, ETC., OF NICKEL poor in carbon.—G. W. Johnson (I. G. Farbenindustrie.) 12707.

ARTIFICIAL RESIN MASSES for glueing, etc., purposes.—H. Klemm. 13018.

PRODUCTION OF ORGANIC COMPOUNDS.—Kodak, Ltd. (United States, April 28, '37.) 12786.

OPERATING MECHANISM FOR COKE-OVEN DOORS.—Koppers Co. (United States, May 5, '37.) 13078.

COKE-OVEN STRUCTURE.—Koppers Co. (United States, May 7, '37.) 13079.

CORROSION-RESISTANT STEEL ALLOYS.—F. Krupp, A.-G. (Germany, May 7, '37.) 13080.

MANUFACTURE OF RUBBER HYDROCHLORIDE FILM.—G. C. Mack. 13135.

PREPARATION OF CATALYSTS.—B. Malishev. (United States, May 3, '37.) 13146.

MANUFACTURE OF COLOURING-MATTERS.—Manchester Oxide Co., Ltd., J. H. Clayton, and B. Bann. 12924.

PROCESS FOR ROASTING FINE SULPHIDES.—Metallges, A.-G. (Germany, June 19, '37.) 12889.

MANUFACTURE OF NON-DISCOLOURING METAL SALTS of highly molecular organic acids.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (Holland, May 13, '37.) 12912.

MANUFACTURE OF INSECTICIDES, ETC.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. (United States, May 4, '37.) 13212.

PROCESS FOR WORKING UP RESIDUES obtained in the distillation of organic acids.—Naamlooze Vennootschap Internationale Suiker en Alcohol Cie, International Sugar and Alcohol Co., Isaco, and E. Farber. (Aug. 4, '37.) 12834.

MANUFACTURE OF HARD METAL ALLOYS, ETC.—Naamlooze Vennootschap Philips' Gloeilampenfabrieken. (Germany, May 5, '37.) 13055, 13056.

RECOVERY OF PALM OIL, ETC.—A. Nyrop. 13066.

COKE OVENS.—Dr. C. Otto and Co., Ges. (Germany, June 16, '37.) 13286.

EXTRACTION OF IMPURITIES FROM SOAP LIQUOR.—R. J. Pickett. 12916.

PRODUCTION OF RESINOUS CONDENSATION PRODUCTS.—J. E. Pollak (Bergwerksverband zur Verwertung von Schutzrechten der Kohlentechnik Ges.). 12752.

PRODUCTION OF HYDROCARBON OILS.—H. E. Potts (Naamlooze Vennootschap Internationale Maatschappij voor Hydreerings-Techniek En-Chemie). 13231.

DESTRUCTIVE HYDROGENATION OF SOLID DISTILLABLE CARBONACEOUS MATERIALS.—H. E. Potts (Naamlooze Vennootschap Internationale Maatschappij voor Hydreerings-Techniek En-Chemie). 13232.

PRODUCTION OF CHEMICAL PRINTING-BLOCKS.—H. Renck. 13015.

DECARBONISATION OF CARBON-CONTAINING METALS, ETC.—I. Rennerfelt, and B. M. S. Kalling. (Sweden, May 5, '37.) 13319.

UREA FORMALDEHYDE RESINS.—Resinous Products and Chemical Co. (United States, April 30, '37.) 12835.

PURIFICATION, ETC., OF COLLOIDAL DISPERSIONS by electrophoresis.—Semperit Ostevreichisch-Amerikanische Gummiwerke, A.-G. (Austria, May 12, '37.) 13072.

AMELIORATION OF THE MAGNETIC PROPERTIES OF METALS and alloys.—Siemens and Halske, A.-G. (Germany, May 4, '37.) 13356.

PRODUCTION OF BACTERIAL PRODUCTS, ETC.—Soc. of Chemical Industry in Basle. (Switzerland, May 19, '37.) 13283; (Switzerland, April 6.) 13284.

SOLVENT TREATMENT OF OILS.—Standard Oil Development Co. (United States, Aug. 3, '37.) 13371.

VERTICAL CHAMBER OVENS for production of gas, etc.—H. Steinfeldt. (Germany, April 29, '37.) 12704.

EXTRACTION OF FAT, ETC., from waste, etc., products.—J. W. Thompson. 13234.

SOLVENT APPARATUS FOR RECOVERING VOLATILE SOLVENTS from solvent-laden air.—A. H. Tod. 12668.

PRODUCTION OF FATTY ACIDS by oxidation of paraffin hydrocarbons.—Vereinigte Oelfabriken Hubbe and Farenholtz, and K. Blass. 13367.

MANUFACTURE OF UNSATURATED ALCOHOL ESTERS.—Dr. A. Wacker Ges für Elektrochemische Industrie Ges. (Germany, May 3, '37.) 12702.

ELECTRO-DEPOSITION OF TIN, ETC.—H. Webb. 13240.

COMPOSITIONS CONTAINING SOLID POLYMERS OF ETHYLENE.—E. G. Williams, and Imperial Chemical Industries, Ltd. 13218.

PRODUCTION OF GREY CAST IRON.—H. J. Young. 13209.

Specifications Open to Public Inspection

RECOVERY OF LOWER ALIPHATIC ACIDS.—Soc. des Usines Chimiques Rhone-Poulenc. Nov. 11, 1936. 20458/37.

VINYL ESTERS.—Carbide and Carbon Chemicals Corporation. Nov. 11, 1936. 28045/37.

APPARATUS FOR VAPORISATION OF FUEL, especially heavy mineral oils.—Svenska Aktiebolaget Gas-Accumulator. Nov. 10, 1936. 29078/37.

CONCENTRATION OF ALIPHATIC ACIDS.—British Celanese, Ltd. Nov. 14, 1936. 30726/37.

BASIC CONDENSATION PRODUCTS.—Chemical Works, formerly Sandoz. Nov. 10, 1936. 30742/37.

EXTRACTING DILUTE ORGANIC ACIDS.—Deutsche Gold-und Silber-Scheideanstalt Vorm-Roessler. Nov. 10, 1936. 30893/37.

MANUFACTURE OF COMPOUNDS containing amino- or imino-groups.—Soc. of Chemical Industry in Basle. (Cognate Application, 30988/37.) Nov. 11, 1936. 30987/37.

MANUFACTURE OF HYDROGENATION PRODUCTS OF FURFUROL.—Deutsche Hydrierwerke, A.-G. Nov. 14, 1936. 31329/37.

MANUFACTURE OF AZO-DYESTUFFS.—Soc. of Chemical Industry in Basle. Nov. 16, 1936. 31480/37.

MANUFACTURE OF AZO-DYESTUFFS and products therefrom.—Soc. of Chemical Industry in Basle. Nov. 16, 1936. 31482/37.

MANUFACTURE OF KETONES.—Standard Alcohol Co. Nov. 7, 1936. 24921/37.

DETERGENTS and like substances.—Standard Oil Development Co. Nov. 7, 1936. 25642/37.

METHOD OF FORMING DELUSTERED SHAPED ARTICLES.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 26219/37.

POLYMERISATION OF GASES.—Houdry Process Corporation. Nov. 7, 1936. 27718/37.

MANUFACTURE AND APPLICATION OF POLYMERISED ORGANIC COMPOUNDS.—British Celanese, Ltd. Nov. 7, 1936. 29635/37.

MANUFACTURE AND PRODUCTION OF HYDROCARBONS and their derivatives from carbon-monoxide and hydrogen.—I. G. Farbenindustrie. Nov. 4, 1936. 29636/37.

PROCESS FOR THE MANUFACTURE OF SILICA GEL.—Soc. Anon. des Produits Chimiques de Laeken. Nov. 5, 1936. 29671/37.

PRODUCING 4-AMINOBENZENESULPHONAMIDE COMPOUNDS.—J. Rosicky. Nov. 4, 1936. 29741/37.

MANUFACTURE OF AZO DYESTUFFS.—I. G. Farbenindustrie. Nov. 4, 1936. 29834/37.

PURIFICATION OF ALKALI METALS.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 30196/37.

RECOVERY OF METALS from their amalgams.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 30298/37.

MANUFACTURE OF ALKALI METALS METALS.—E. I. du Pont de Nemours and Co. Nov. 4, 1936. 30299/37.

HYDROLYTIC DECOMPOSITION OF TITANIUM SALT SOLUTIONS.—Titan Co., Inc. Nov. 6, 1936. 30413/37.

MANUFACTURE OF CHLORINATED ALIPHATIC HYDROCARBONS.—E. I. du Pont de Nemours and Co. Nov. 5, 1936. 30421/37.

TREATMENT OF PALM OIL and products thereof.—F. M. Sullivan. Nov. 7, 1936. 30600/37.

REFINING OF HYDROCARBON OILS.—Edeleanu Ges. Nov. 7. 1936. 30624/37.

Specifications Accepted with Dates of Application

PRODUCTION OF SYNTHETIC RESINS.—Kodak (Eastman Kodak Co.). July 30, 1936. 484,469.

PRODUCTION OF GRANULAR ACTIVE CARBON.—W. Hene. Sept. 25, 1936. 484,197.

PREPARATION OF COMPOSITIONS containing ureaformaldehyde condensation products.—S. L. M. Saunders, and L. W. Coveney. Sept. 28, 1936. 484,200.

CONDENSATION PRODUCTS from polyvinyl esters.—W. W. Groves (I. G. Farbenindustrie.) Oct. 31, 1936. 484,476.

METHOD OF AND APPARATUS FOR THE PREPARATION OF PARAFFIN WAXES or oil-wax mixtures.—Burmah Oil Co., Ltd., and R. E. Downer. Nov. 2, 1936. 484,207.

PRODUCTION OF METHYLOLUREA in solution or crystalline form. N. Lubiez. Nov. 2, 1936. 484,209.

TREATMENT OF LATEX.—W. W. Triggs (Wingfoot Corporation). Nov. 4, 1936. (Convention date not granted.) 484,659.

MANUFACTURE AND PRODUCTION OF UNSATURATED HYDROCARBONS. G. W. Johnson (I. G. Farbenindustrie.) Nov. 4, 1936. (Cognate Application, 25720/37.) 484,660.

CHLORINATING OR BROMINATING KETONES.—I. G. Farbenindustrie. Nov. 5, 1935. (Samples furnished.) 484,409.

DECARBONISING OF CARBON-CONTAINING IRON or iron alloys.—I. Rennerfelt. Nov. 4, 1935. 484,662.

PROCESS FOR THE MANUFACTURE OF AZO DYESTUFFS.—A. Carpmael (I. G. Farbenindustrie.) Nov. 5, 1936. 484,577.

ELECTROLYTICALLY OXIDISING ALUMINIUM and aluminium alloys by means of alternating current.—Vereinigte Aluminumwerke, A.-G. Nov. 5, 1935. 484,492.

LIME-ZEOLITE WATER-SOFTENING PROCESSES.—R. Furness, H. J. Wheaton, and J. Crosfield and Sons, Ltd. Nov. 5, 1936. 484,494.

MANUFACTURE OF PRINTING PASTES, and dyestuffs for making the same.—Soc. of Chemical Industry in Basle. Nov. 12, 1935. 484,214.

PROCESS FOR THE MANUFACTURE OF CONDENSATION PRODUCTS from urea and/or thiourea and formaldehyde.—H. D. Elkington (Nowack, A.-G.) Nov. 6, 1936. 484,415.

DYESTUFFS OF THE ANTHRAQUINONE SERIES and its manufacture.—E. I. du Pont de Nemours and Co. Nov. 6, 1936. 484,678.

DYESTUFFS INTERMEDIATES of the anthraquione series, and their manufacture.—E. I. du Pont de Nemours and Co. Nov. 6, 1936. 484,679.

MANUFACTURE OF ARSENOBENZENEMONOSULPHOXYLATES.—I. G. Farbenindustrie. Dec. 19, 1935. 484,594.

PROCESS FOR THE MANUFACTURE OF TETRAKISAZODYESTUFFS containing copper.—I. G. Farbenindustrie. Nov. 7, 1936. 484,597.

MANUFACTURE OF POLYMERISATION PRODUCTS.—I. G. Farbenindustrie. Nov. 9, 1935. 484,599.

MANUFACTURE AND PRODUCTION OF URETHANES containing carboxyl or sulphonic acid groups.—I. G. Farbenindustrie. Nov. 8, 1935. (Samples furnished.) 484,683.

CATALYTIC TREATMENT OF PARAFFIN HYDROCARBONS.—Universal Oil Products Co. Nov. 11, 1935. 484,417.

MANUFACTURE AND PRODUCTION OF ACETALDEHYDE from gases containing acetylene.—I. G. Farbenindustrie. Nov. 25, 1936. 484,500.

METHODS OF PURIFYING CRUDE DIAMINO-ARSENOBENZENE BASES. W. C. Fairweather (Pharmeceutische Ges. Vadeg, A.-G.). Dec. 5, 1936. 484,506.

CARBONISATION OF COAL-TAR PITCH, petroleum pitch, and like materials.—A. R. Griggs. Dec. 8, 1936. 484,324.

PROCESSES FOR THE MANUFACTURE OF TUNGSTEN from its ores, salts, or other compounds of tungsten.—D. Gardner. Dec. 21, 1936. 484,329.

MODIFIED HALOGEN-CONTAINING RUBBER DERIVATIVES.—W. J. Tennant (Marbon Corporation). Dec. 29, 1936. 484,225.

TREATMENT WITH HYDROGENATING GASES of extraction products of solid carbonaceous materials.—H. E. Potts (International Hydrenation Patents Co., Ltd.). Jan. 12, 1937. 484,334.

PRODUCTION OF RESINS SOLUBLE IN SPIRIT.—G. W. Johnson (I. G. Farbenindustrie). Feb. 13, 1937. 484,619.

APPARATUS FOR SEPARATING MAGNESIUM, beryllium, and like metals which distil from their ores and compounds.—H. A. Blackwell and W. L. Turner. Feb. 16, 1937. 484,429.

MANUFACTURE AND PRODUCTION OF UNSATURATED HYDROCARBONS. G. W. Johnson (I. G. Farbenindustrie). Feb. 20, 1937. 484,525.

HYDROCARBON OIL CONVERSION.—Naamlooze Vennootschap Nieuwe Octrooi Maatschappij. April 1, 1936. 484,527.

APPARATUS FOR DEODORISING AND REMOVING DUST from gases from furnaces for calcining liquors containing combustion residues.—Raffinerie Tirlemontoise Soc. Anon. April 10, 1936. 484,532.

SEPARATING NITRILE-HYDROCARBON MIXTURES.—Armour and Co. Sept. 14, 1936. 484,352.

HYDROGENATION PROCESS.—L. Mellersh-Jackson (Hercules Powder Co.). May 11, 1937. 484,357.

FORMATION OF PLATES OF COPPER coated with cuprous oxide for use in rectifiers.—Standard Telephones and Cables, Ltd. (Nippon Electric Co., Ltd.). May 14, 1937. 484,359.

PRODUCTION OF CONCENTRATED SOLUTIONS of sodium or potassium disulphite.—Tomaszowska Fabryka Sztucznego Jedwabiu Spolka Aksyjna, A. Borynec, and C. Poznanski. May 21, 1937.

PRODUCTION OF SILICON IRON.—Heraeus Vacuumschmelze A.-G. June 27, 1936. 484,637.

CATALYTIC TREATMENT OF MOTOR FUELS.—A. L. Mond (Universal Oil Products Co.). June 16, 1937. 484,368.

PRODUCTION OF ALCOHOLS.—Naamlooze Vennootschap Bataafsche Petroleum Maatschappij. June 17, 1936. 484,437.

LEA- ALLOYS.—E. L. W. Byrne (American Smelting and Refining Co.). Aug. 4, 1937. 484,546.

MAKING ALKALI SUBSILICATE PRODUCTS.—Pennsylvania Salt Manufacturing Co. Sept. 3, 1936. 484,547.

PRODUCING METALS AND ALLOYS having a low content of carbon and silicon.—Wargons Aktiebolag. Sept. 9, 1936. 484,270.

MANUFACTURE OF SALTS OF CELLULOSE ETHER CARBOXYLIC ACIDS. Kalle and Co. A.-G. Nov. 21, 1936. 484,386.

Chemical and Allied Stocks and Shares

ALTHOUGH, on balance, movements in the industrial section of the Stock Exchange have been adverse to holders, the undertone of markets is generally regarded to have been better than might have been expected, bearing in mind the influence on sentiment of the developments in European political affairs.

With few exceptions securities of companies associated with the chemical and allied trades have moved against holders, but this has to be read in relation to surrounding market conditions. At the time of writing a firmer trend appears to be developing and it is reported that the lower prices are tending to bring in buyers. Distillers have moved against the general trend and at 97s. 3d. are 3s. higher on the week. This reflects the view now current in some quarters of the market that the dividend may be raised from 22½ per cent. to 25 per cent. Boots Pure Drug were steadier and at 39s. 9d. have recovered part of their recent sharp decline. On the other hand, British Oxygen have declined further from 68s. 9d. to 68s. in view of the statement at the meeting indicating that additional preference shares may be issued. Nevertheless, the market assumes that they will probably be offered to shareholders at a reasonably attractive price. The continued expansion of the business also suggests prospects that the upward movement in the company's profits may continue this year. Imperial Chemical have lost 1s. 1½d. to 29s. 7½d., and B. Laporte have gone back to 87s. 6d.xd although the full results of the latter company confirm that the 22½ per cent. dividend is covered by a considerable margin of profits.

General Refractories have been reactionary and have declined from 16s. 6d. to 12s. 6d. since publication of the past year's results. Turner and Newall were lower at 78s., the disposition still being to await the interim dividend announcement. Associated Portland Cement were lower and British Plaster Board lost part of their recent improvement despite the favourable dividend estimates current in the market. Sangers at 22s. 3d. are within 6d. of the price current a week ago, sentiment having been assisted by hopes that the distribution for the year may be kept on a 25 per cent. basis. Timothy Whites and Taylors have reacted 1s. to 26s. 6d. and Beechams Pills deferred shares are 52s. 6d. compared with 53s. 1½d. a week ago. British Drug Houses again have a list price of 23s. 9d. "middle" while Greeff-Chemicals Holdings remained at 7s. 6d. and Monsanto Chemicals preference at 22s. 6d.

Fison Packard and Prentice were steady at 34s. 4½d., aided by the interim dividend, and Cooper McDougall were again around 29s. Wall Paper deferred shares reacted to 36s. 9d., but this partly reflects the deduction of the interim dividend from the price. Reckitt and Sons' ordinary were a steady feature at £5½ as were Cerebos ordinary at £8½. Pinchin Johnson held up fairly well and are now around 29s., while International Paint and most other shares of paint manufacturers also had a fairly steady appearance. British Match were lower at 32s. following the remarks at the meeting, and Swedish Match have also not kept best prices this week. Lever and Unilever at 36s. 9d. are within a few pence of the price ruling a week ago. Barry and Staines were moderately higher at 38s. 3d., while Michael Nairn were unchanged at 58s. 9d.

Most iron, steel and kindred shares have reacted further in price. Dorman Long were weak, as were Colvilles and United Steel, but a better tendency was shown later in the week. Pease and Partners were relatively steady, the 10 per cent. dividend being up to best market expectations. Consett Iron were aided by hopes that the dividend may also be raised to 10 per cent. in this case.

Oil shares have made some recovery from the lower prices made earlier in the week. The 20 per cent., tax free, dividend announced by the "Shell" company was in accordance with estimates. Anticipations of 22½ per cent. from Anglo-Iranian have continued in the market this week.

Weekly Prices of British Chemical Products

THE demand for industrial chemicals has not been particularly bright during the past week and what buying has been in progress has been mainly confined to small lots for spot or nearby requirements. Although ex-contract deliveries are going forward with fair regularity consumers are adopting a cautious policy in regard to fresh commitments. The market on the whole is very steady and values, with the exception of lead products, are well held. The convention quotations for red lead were reduced by £1 per ton as from May 20, other quoations remaining as reported last week. In the coal tar section there is little of interest to record and in the absence of any substantial buying orders the quoted prices must be regarded as nominal. Naphthalene is receiving a little more inquiry.

MANCHESTER.—There has again been a small number of contracts reported on the Manchester chemical market during the past week in connection with deliveries over the second half of the year and a moderate volume of new business composed of small lots for delivery over near positions, but in the aggregate the trade put through has not been at all extensive. The call for textile chemicals from both Lancashire and West Yorkshire users is still rather disappointing, but in most other directions supplies are moving into consumption against contracts on a fair scale. Prices as a whole so far as the heavy chemicals are concerned are steady. The demand for the by-products is quiet for the most part, but with the exception of a fresh weakness in crude carbolic prices show only slight changes.

Price Changes

Falls: Cresylic Acid, pale 99/100% (Manchester); Pyridine (Manchester); Calcium Acetate, grey (Manchester); Lead, red; Litharge (Scotland); Potassium Prussiate (Scotland); Copper Sulphate (Scotland); Lead Acetate (Scotland).

GLASGOW.—There has been a steady day to day demand for home trade during the week, but export business remains very quiet. Prices generally continue steady at about previous figures, but since our last report, red lead, litharge, and copper products have been reduced, on account of the fall in metal prices.

General Chemicals

ACETONE.—**£45 to £47 per ton**

ACETIC ACID.—Tech, 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech. glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 2s. 6d. per ton d/d Lancs. GLASGOW: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders. SCOTLAND: 10½d. to 1s. 0½d., containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE.—Grey galvanising, £19 per ton, ex wharf.

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

AMMONIUM DICHROMATE.—8½d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £11 per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £16 10s. per ton ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £11 10s. per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contracts. SCOTLAND: £9 per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16, crystal, £17; powdered, £17 10s. per ton in 1-cwt. bags, carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 3½d. per lb. d/d station in 70-lb. cylinders (1-ton lots).

CHROMETAN.—Crystals, 2½d. per lb.; liquor, £13 per ton d/d station in drums. GLASGOW: 70/75% solid, £5 15s. per ton net ex store.

CHROMIC ACID.—10d. per lb., less 2½%; d/d U.K.

CHROMIUM OXIDE.—11d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0½d. per lb. MANCHESTER: 1s. 0½d. SCOTLAND: B.P. crystals, 1s. 0½d. per lb.; less 5%, ex store.

COPPER SULPHATE.—£21 7s. 6d. per ton, less 2% in casks. MANCHESTER: £18 10s. per ton f.o.b. SCOTLAND: £18 15s. per ton, less 5%, Liverpool, in casks.

CREAM OF TARTAR.—100%, 92s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1.260 s.g., in tins, £4 2s. 6d. to £5 2s. 6d. per cwt. according to quantity; in drums, £3 15s. 0d. to £4 7s. 6d.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 4d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One-ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. GLASGOW: White crystals, £30; brown, £1 per ton less. MANCHESTER: White, £32; brown, £31.

LEAD, NITRATE.—£32 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. SCOTLAND: £31 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—SCOTLAND: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

MAGNESIUM CHLORIDE.—SCOTLAND: £7 10s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY.—Ammoniated B.P. (white precip.), lump, 5s. 10d. per lb.; powder B.P., 6s. 0d.; bichloride B.P. (corros. sub.) 5s. 1d.; powder B.P. 4s. 9d.; chloride B.P. (calomel), 5s. 10d.; red oxide cryst. (red precip.), 6s. 11d.; levig. 6s. 5d.; yellow oxide B.P. 6s. 3d.; persulphate white B.P.C., 6s 0d.; sulphide black (hvd. sulph. cum sulph. 50%), 5s. 11d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. GLASGOW: £2 9s. per cwt. in casks. MANCHESTER: £49 to £54 per ton ex store.

PARAFFIN WAX.—SCOTLAND: 3¾d. per lb.

POTASH CAUSTIC.—Solid, £35 5s to £40 per ton according to quantity, ex store; broken, £42 per ton. MANCHESTER: £38 10s.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. GLASGOW: 4¼d. per lb. MANCHESTER: £37 10s. per ton.

POTASSIUM DICHROMATE.—5½d. per lb. carriage paid. SCOTLAND: 5¼d. per lb., net, carriage paid.

POTASSIUM IODIDE.—B.P. 5s. 6d per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity. GLASGOW: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.

POTASSIUM PERMANGANATE.—LONDON: 9¾d. per lb. SCOTLAND: B.P. Crystals, 9¾d. MANCHESTER: B.P. 10¾d. to 1s.

POTASSIUM PRUSSIATE.—6¼d. per lb. SCOTLAND: 7d. net, in casks, ex store. MANCHESTER: Yellow, 6½d. to 6¼d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALAMMONIAC.—Firsts lump, spot, £42 17s. 6d. per ton, d/d address in barrels. Dog-tooth crystals, £36 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

SALT CAKE.—Unground, spot, £3 11s. per ton.

SODA ASH.—58% spot, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, 13s. 10s. per ton d/d station. SCOTLAND: Powdered 98/99%, £18 10s. in drums, £19 5s. in casks, Solid 76/77° £15 12s. 6d. in drums; 70/73%, £15 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts, 10s. per ton less.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 15s. per ton d/d station in bags. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags. MANCHESTER: £10 10s.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.

SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.

SODIUM DICHROMATE.—Crystals cake and powder 4½d. per lb. net d/d U.K. with rebates for contracts. MANCHESTER:

SODIUM CHROMATE.—4½d. per lb. d/d U.K.
4d. per lb. GLASGOW: 4½d. net, carriage paid.

SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.

SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.

SODIUM NITRATE.—Refined, £8 per ton for 6-ton lots d/d. GLASGOW: £1 12s 0d. per cwt. in 1-cwt kegs, net, ex store.

SODIUM NITRITE.—£18 5s. per ton for ton lots.

SODIUM PERBORATE.—10%, 9½d. per lb. d/d in 1-cwt. drums.

SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £15 to £16 per ton delivered per ton lots.

SODIUM PRUSSIATE.—d. per lb. for ton lots. GLASGOW: 5d. to 5¾d. ex store. MANCHESTER: 4¼d. to 5¼d.

SODIUM SILICATE.—£8 2s. 6d. per ton.

SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 12s. 6d.

SODIUM SULPHIDE.—Solid 60/62%. Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.

SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.

TARTARIC ACID.—1s. 1½d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. to 1s. 1½d. per lb. GLASGOW: 1s. 1d. per lb., 5%, ex store.

ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2 cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7d. to 1s. 2d. per lb., according to quality. Crimson, 1s. 6d. to 1s. 7½d. per lb.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARYTES.—£6 to £6 10s. per ton, according to quality.

CADMIUM SULPHIDE.—4s. 3d. to 4s. 6d. per lb.

CARBON BLACK.—3⅞d. to 3 15/16d. per lb., ex store.

CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.

CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.

CHROMIUM OXIDE.—Green, 10½d. to 11d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

INDIA-RUBBER SUBSTITUTES.—White, 4⅜d. to 5¼d. per lb.; dark 3⅜d. to 4¼d. per lb.

LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.

LEAD HYPOSULPHITE.—9d. per lb.

LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.

SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.

VERMILION.—Pale, or deep, 4s. 9d. per lb., 1-cwt. lots.

ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1938: November, £7 8s.; December, £7 9s. 6d.; January, 1938, £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.

CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1938: November, £7 10s.; December, £7 11s. 3d.; January, 1938, £7 12s. 6d.; February, £7 13s. 9d.; March, £7 15s.; April/June, £7 16s. 3d.

NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1938.

SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1938.

CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3d. to 1s. 3½d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 8d. to 1s. 8½d. GLASGOW: Crude, 10d. to 10½d. per gal.; motor, 1s. 4d. to 1s. 4½d. MANCHESTER: Pure, 1s. 7d. to 1s. 8d. per gal.; crude, 11½d. to 1s. per gal.

CARBOLIC ACID.—Crystals, 7¾d. to 8½d. per lb., small quantities would be dearer; Crude, 60's, 3s. 0d. to 3s. 3d.; dehydrated, 4s. 4½d. to 4s. 7½d. per gal. MANCHESTER: Crystals, 7½d. to 7¾d. per lb. f.o.b. in drums; crude, 2s. 3d. to 2s. 6d. per gal.

CREOSOTE.—Home trade, 5½d. per gal., f.o.r. makers' works; exports, 6⅝d. to 6⅝d. per gal., according to grade MANCHESTER: 4½d. to 5¾d. GLASGOW: B.S.I. Specification, 6d. to 6¼d. per gal.; washed oil, 5d. to 5¼d.; lower sp. gr oils, 5⅜d. to 6¼d.

CRESYLIC ACID.—97/99%, 2s. 2d. to 2s. 5d.; 99/100%, 4s. to 5s. 6d. per gal., according to specification; Pale, 99/100%, 2s. 6d. to 2s. 9d.; Dark, 95%, 1s. 10d. to 2s. per gal. GLASGOW: Pale, 99/100%, 5s. to 5s. 6d. per gal.; pale, 97/99%, 4s. 6d. to 4s. 10d., dark, 97/99%, 4s. 3d. to 4s. 6d.; high boiling acids, 2s. to 2s. 6d. American specification. 3s. 9d. to 4s. MANCHESTER: Pale, 99/100%, 2s. 10d.

NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1d. to 1s. 3d. per gal., naked at works, according to quantity. GLASGOW: Crude, 6½d. to 7¼d. per gal.; 90%, 160, 1s. 5d. to 1s. 6d., 90%, 190, 1s. 1d. to 1s. 3d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £5 5s. to £6 5s. per ton; purified crystals, £14 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £5 10s. to £7 per ton. GLASGOW: Fire lighter, crude, £6 to £7 per ton (bags free). MANCHESTER: Refined, £15 per ton f.o.b.

PITCH.—Medium, soft, 33s. per ton, f.o.b. MANCHESTER: 32s. 6d. f.o.b., East Coast. GLASGOW: f.o.b. Glasgow, 35s. to 37s. per ton; in bulk for home trade, 35s.

PYRIDINE.—90/140%, 13s. 6d. to 15s. per gal.; 90/160%, 10s. 6d. to 13s. 3d. per gal.; 90/180%, 3s. 3d. to 4s. per gal. f.o.b. GLASGOW: 90% 140, 10s. to 12s. per gal.; 90% 160, 9s. to 10s.; 90% 180, 2s. 6d. to 3s. MANCHESTER: 10s. to 11s. 6d. per gal.

TOLUOL.—90%, 1s. 10d. per gal.; pure, 2s. 2d. GLASGOW: 90%, 120, 1s. 10d. to 2s. 1d. per gal.

XYLOL.—Commercial, 1s. 11d. to 2s. per gal.; pure, 2s. 3d. to 2s. 3½d. GLASGOW: Commercial, 2s. to 2s. 1d. per gal.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £7 5s. to £9 15s. per ton; grey, £9 5s. to £9 15s. MANCHESTER: Brown, £9; grey, £10 10s.

METHYL ACETONE.—40.50%, £35 to £40 per ton.

WOOD CREOSOTE.—Unrefined, 4d. to 6d. per gal., according to boiling range.

WOOD NAPHTHA, MISCIBLE.—3s. 3d. to 3s. 6d. per gal.; solvent, 3s. 6d. to 3s. 9d. per gal.

WOOD TAR.—£2 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free

BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.

BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11½d. per lb. d/d buyer's works.

m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.

o-CRESOL 30/31° C.—6½d to 7½d. per lb. in 1-ton lots.

p-CRESOL, 34-5° C.—1s. 7d. to 1s. 8d. per lb. in ton lots.

DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.

DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.

DINITROBENZENE.—8½d. per lb.

DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.

DINITROTOLUENE.—48/50° C., 9½d. per lb.; 66/68° C., 11d.

DIPHENYLAMINE.—Spot, 2s. 2d. per lb., d/d buyer's works.

GAMMA ACID, Spot, 4s. 4½d. per lb. 100% d/d buyer's works.

H ACID.—Spot, 2s. 7d. per lb.; 100% d/d buyer's works.

NAPHTHIONIC ACID.—1s. 10d. per lb.

β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.

α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.

β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.

NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.

o-NITRANILINE.—4s. 3½d per lb.

m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.

p-NITRANILINE.—Spot, 1s. 10d. to 2s. 3½d. per lb. d/d buyer's works.

NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra. 1-ton lots d/d buyer's works.

NITRONAPHTHALENE.—10½d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.

SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works

o-TOLUIDINE.—11½d. per lb., in 8/10-cwt. drums, drums extra.

p-TOLUIDINE.—2s. per lb., in casks.

m-XYLIDINE ACETATE.—4s. 8d. per lb., 100%.

COMPANY MEETING.

Beechams Pills Limited

Record Profit

The tenth ordinary general meeting of Beechams Pills, Limited, was held on May 26, at the May Fair Hotel, London, W.

Mr. Philip E. Hill (the chairman) said that the profit of £600,908, although a record in the company's history and an increase over that of last year of £59,498 was disappointing insofar as the home sales were concerned. That was attributable entirely to the exceptionally mild winter experienced and the adverse effect it had had on the sale of the company's seasonal products. Under normal conditions the profits should have been greater. The result of the export business, however, was most encouraging and showed an increase over last year's figures of more than £20,000.

Some ninety years ago the business of Beechams Pills was founded by the late Thomas Beecham, and to-day the Beecham factory at St. Helens produced over 11 million pills per week, and that was entirely apart from the production of the Beecham factories in different parts of the world.

The directors had continued their policy of extensive advertising and general propaganda, and he thought they could safely congratulate themselves on the results. Their development fund was still fathering new products and their overseas trade. The directors recommended again bringing that reserve up to £100,000.

Company's Products

The company owned and marketed the following proprietary articles:—Beechams Pills, Beechams Powders, Beechams Lung Syrup, Cassell's Tablets, Veno's Lightning Cough Cure, Cicfa, Dinnefords Magnesia & Tablets, Germolene Ointment & Soap, Holloway's Pills and Ointment, Iron Jelloids, Lactopeptine, Nicocin, Phensic, Phosferine, Ashton and Parsons Baby Powders, Phyllosan, Sherley's Dog and Cat Foods and Medicines, Yeast-Vite Tablets, Amami Shampoos and other products.

The proposed bonus issue of preference shares redeemed at average periods, over the next ten years would require, with the premium on redemption, an additional £45,000 annually. That should be provided without imposing difficulties on the company in continuing the payment of a dividend of 85 per cent., provided, of course, that unforeseen events outside the control of the Board did not arise.

A Bonus Issue

The directors were of opinion that it would be of enormous value to their business if more of their customers could have a financial interest in the company and so benefit by its prosperity. Their existing five shilling deferred shares fluctuated in price during a year between, say, fifty shillings and sixty-five shillings, a figure beyond the means of the small investor, who constituted the backbone of their business. The directors were exploring every channel to see whether it was not possible to devise a scheme whereby an interest in their company could not be offered in a unit with a market purchase price around five shillings. He would not be misunderstood. No fresh issue of capital for cash was contemplated, and if a scheme was devised, it would be submitted to every shareholder for approval.

The directors had felt for a long time past that the present share capital of the company did not represent the intrinsic value of the assets. Accordingly they had revalued the investments in their subsidiary companies with the result that Messrs. Price, Waterhouse and Co. had advised the company that the value of such investments was not less than £2,500,000 and the value of such investments had accordingly been placed at that figure and the increase in value placed to a capital reserve account. From that account £300,000 had been transferred to general reserve, and it was proposed to capitalise that sum immediately into 5 per cent. redeemable cumulative preference shares of £1 each which it was proposed to issue as a bonus credited as fully paid to the holders of deferred shares in the proportion of one such £1 share for each four deferred shares of 5s. each at present held. Those shares would be redeemed by the company out of profits on or before the 31st March, 1949, or by yearly drawings of 22s. per share. To prevent the possibility of the preferred ordinary shares being in any way prejudiced, the directors were recommending the shareholders to convert those preferred shares into 10 per cent. cumulative preferred ordinary shares, giving the holders the right to a fixed cumulative 10 per cent. dividend, payable before the 5 per cent. redeemable cumulative preference shares or the deferred shares received any dividend at all. That was a valuable concession, because hitherto the 2 per cent. participation on the preferred shares was not cumulative and would not be payable if in any one year the deferred shares did not receive 8 per cent. Under existing proposals the 10 per cent. would be payable before any dividend was paid either on the 5 per cent. redeemable preference shares or any dividend whatever on the deferred shares.

They possessed a business which to-day was stronger than it had ever been and under ordinary conditions should continue to make increasing profits.

The report was unanimously adopted and a hearty vote of thanks was accorded to the chairman, directors and staff.

At subsequent meetings the capital proposals were approved.

Company News

B. Laporte have announced a final dividend of 17½ per cent., making 22½ per cent. less tax (same).

Crosfields Oil and Cake have announced a dividend of 15 per cent. and bonus of 5 per cent., making 20 per cent., less tax (same).

British Tyre and Rubber Co., have announced an interim on the ordinary of 3¼ per cent. actual, less tax (same). Warrants will be posted June 8.

W. J. Bush and Co., show net profit for 1937 at £116,265 (£119,183). To tax, N.D.C. and exchange, £18,779 (£16,740); final of 8 per cent. on ordinary, making 13 per cent. (same); to reserve against freehold works, £5,000; to reserve against possible plant obsolescence, £5,000; writing off goodwill, £50,000; forward, £114,562 (£115,826).

Tate and Lyle, Ltd., have declared an interim dividend of 4¼ per cent., less tax, on the £4,760,000 ordinary share capital on account of the year ending September 30 next. A similar interim was paid last year followed by a final of 14 per cent., making a total distribution of 18¼ per cent. In addition to the ordinary share capital there is £1,100,000 in 6½ per cent. cumulative preference shares, making a total issued capital of £5,860,000.

General Refractories group in 1937 earned trading profits of £166,436 and after £40,960 for depreciation, net profits attributable to the parent company totalled £81,600. Of the sum set aside for depreciation, £25,000 was from the central fund. Trading profit of the parent company alone was £117,700, and the net figure (subject to depreciation) £104,726. In view of the change in the business outlook since the interim of 8 per cent. was declared, the directors do not advise the payment of a dividend higher than that of last year, and accordingly recommend a final of 8 per cent., less tax, making 16 per cent. The previous year's distribution comprised an interim of 6 per cent. and a final of 10 per cent.

Wiggins, Teape and Co. (1919), in their full report for 1937, shows that further excellent progress has been made. Aggregate net profits (before tax) of the company and its subsidiaries expanded by £125,126, to £623,682. The profits available to the parent company are up from £454,090 to £524,797. The final ordinary dividend, as already announced, is 5 per cent., accompanied by a 2 per cent. cash bonus, making a total of 10 per cent. for the year. This compares with 9 per cent. a year ago, which included a bonus of 1 per cent. The transfer to reserve against investments is raised from £9,369 to £11,500, while tax and N.D.C. take £59,606, against £26,130 for tax; income-tax equalisation reserve and special obsolescence reserve again receive £10,000 and £15,000 respectively. After increasing the allocation to reserve from £85,000 to £96,322, the carry-forward is £52,666, compared with £52,351.

Forthcoming Events

London.

May 30.—The Chemical Club. 2 Whitehall Court, S.W.1. 8 p.m. Dinner.

May 31.—The Fuel Research Station. Visitors' Day.

May 31-June 3.—Institution of Gas Engineers. Annual General Meeting.

June 2.—The Chemical Society. Burlington House, Piccadilly, W.1. 8 p.m. Ordinary Scientific Meeting. Dr. T. G. Pearson, Dr. R. H. Purcell and Mr. G. S. Saigh, "Methylene"; Dr. R. H. Griffith, "The Hydrogenation of Simple Sulphur Compounds"; Professor R. G. W. Norrish, "Primary Photochemical Reactions."

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Canada.—A well-established agent at Montreal wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemicals used in the paint, varnish, rubber, paper, printing ink and tanning industries for Eastern Canada. (Ref. No. 361.)

Canada.—A well-established agent at Toronto wishes to obtain the representation, on a commission or consignment basis, of United Kingdom manufacturers of chemicals, dyestuffs, supplies for the textile, leather, paper and paint industries for Ontario. (Ref. No. 362.)